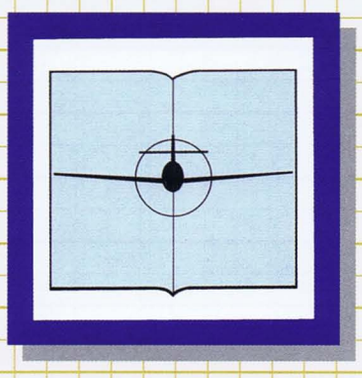
JET PLANES of the Third Reich,

THE SECRET PROJECTS

VOLUME ONE

JET PLANES of the Third Reich, THE SECRET PROJECTS



OTHER FINE BOOKS FROM MONOGRAM

Monarch-1, Arado 234 Blitz
J.R. Smith & E.J. Creek
ISBN: 0-914144-51-0

Monarch-2, Dornier 335 Arrow
By Smith, Creek & Hitchcock
ISBN: 0-914144-52-9

The Official Monogram US Navy & Marine Corps Aircraft Color Guide 1950-1959, Vol. 3
By Maj. John M. Elliott USMC ret.
ISBN: 0-914144-33-2

The Official Monogram US Navy & Marine Corps Aircraft Color Guide 1960-1993, Vol. 4
By Maj. John M. Elliott USMC ret.
ISBN: 0-914144-34-0

German Aircraft Interiors 1935-1945, Vol.1
By Kenneth A. Merrick
ISBN: 0-914144-41-3

The Vanishing Paperclips, America's Aerospace Secret, A Personal Account
By Hans H. Amtmann
ISBN: 0-914144-35-9

V-Missiles of the Third Reich
By Dieter Hölsken
ISBN: 0-914144-42-1

The Official Monogram US Army Air Service & Air Corps Aircraft Color Guide 1908-1941, Vol. 1
By Robert D. Archer
ISBN: 0-914144-46-4

JET PLANES of the Third Reich, THE SECRET PROJECTS

VOLUME ONE

MANFRED GRIEHL

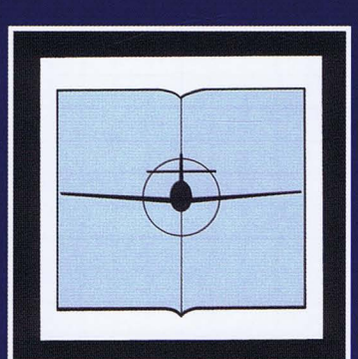
Monogram Aviation Publications, Sturbridge, Massachusetts

Library of Congress Card Number
98-65718
ISBN 0-91414-36-7
Printed in Hong Kong

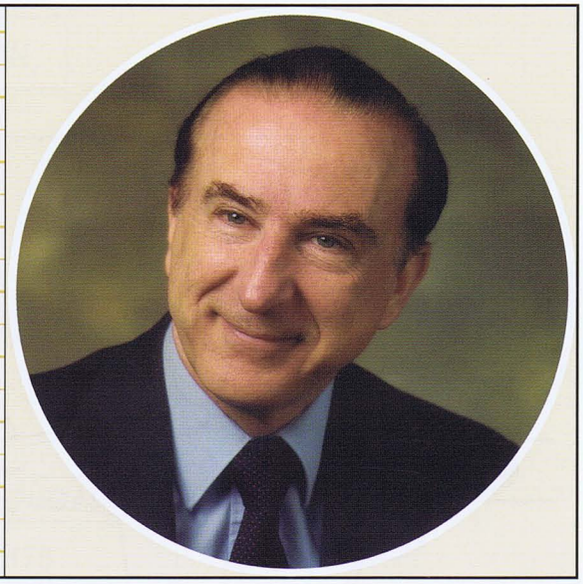
Published by Monogram Aviation Publications
Post Office Box 223, Sturbridge, Massachusetts 01566 USA

CONTENTS


ACHTUNG!
AM BUGRAD
NICHT SCHLEPPE



PUBLISHER'S PREFACE



By Thomas H. Hitchcock

In 1982, Monogram published the 400-page tome, *Jet Planes of the Third Reich.** This remarkable volume documented the birth of jet-powered flight within Germany during the war years and focused on jet-powered aircraft that were actually completed, flown, and committed to operations before May 8, 1945. The authors established that although Germany was the first nation to build and fly an aircraft powered solely by the jet engine,** other nations also were actively pursuing this new means of aircraft propulsion — in particular Great Britain and the United States.

This first volume of *Jet Planes of the Third Reich, The Secret Projects,* is a logical conclusion to a captivating period of aviation history. It covers mainly those German jet and rocket aircraft projects that were designed prior to V-E Day, but failed to reach prototype status. In addition, it examines those few projects that actually reached an advanced stage of construction prior to the end of the war in Europe and also those special projects that were further developed in the immediate postwar years.

This is a survey of all known projects, not an in-depth analysis of any one design, aircraft engineer or manufacturer. Rather, the author has chosen to limit his findings to the most significant facts and events as they relate to specific companies and their achievements. Manfred Griehl, well known to aviation historians, has arranged the work according to the primary combat mission of the various design projects. The single-seat fighter was deemed the most important combat aircraft within the Luftwaffe from 1944 to the end of the war; thus it was understandable that this category of warplane received the highest priority. Naturally, German designers investigated every conceivable manner in which this type of warplane could be adapted to reaction propulsion. Consequently, the first chapter not only contains more aircraft designs than any other, and is also the most lengthy chapter, occupying 90 percent of Volume 1.

It is generally acknowledged that Germany won the aviation-technology research war. Yet most scholars state that this achievement, by itself, could not have proven decisive. There were too many adverse factors working against the Germans: the weight of Allied bombing, the weakness of antiaircraft measures, the failure of industry to decentralize, the shortages of material, the loss of skilled and dedicated workers, the inadequate pilot training programs, and the inherent weakness of the Nazi political system could not overcome the enormous Allied advantage in manpower, materiel, and resources. That the Germans were able to accomplish what they did, in the face of such obstacles, is remarkable, but the true significance of their work lies beyond the Third Reich.

Some insight into the nature of the German failure can be measured by the comments of its fallen leader, Reichsmarschall Hermann Wilhelm Göring, who, soon after his capture by American forces said: "I am convinced that the jet planes would have won the war for us if we had had only four or five months' time. Our underground installations were all ready. The factory at Kahla† had a capacity of 1,100 to 1,200 jet planes a month. Now with 5,000 to 6,000 jets, the outcome would have been quite different." It is unclear wheather Göring was playing to his captors, or if he really believed this. If, on the other hand, he had postulated such a scenario for 1943-44, there is no doubt the war's outcome would have been delayed but not averted.

Proceeding through this volume, you will be amazed at the number, diversity, and originality of the various German aircraft projects. It is an astonishing record — there was no shortage of ideas or creativity — every idea and possibility, no matter how unorthodox, was explored, expanded and advanced. Some projects were nothing more than serious flights of fancy, such as the multitude of Junkers "EFo" studies in the early forties. Others were quite a different matter. A few might even be considered relatively "modern" if viewed from the perspective of current aircraft design.

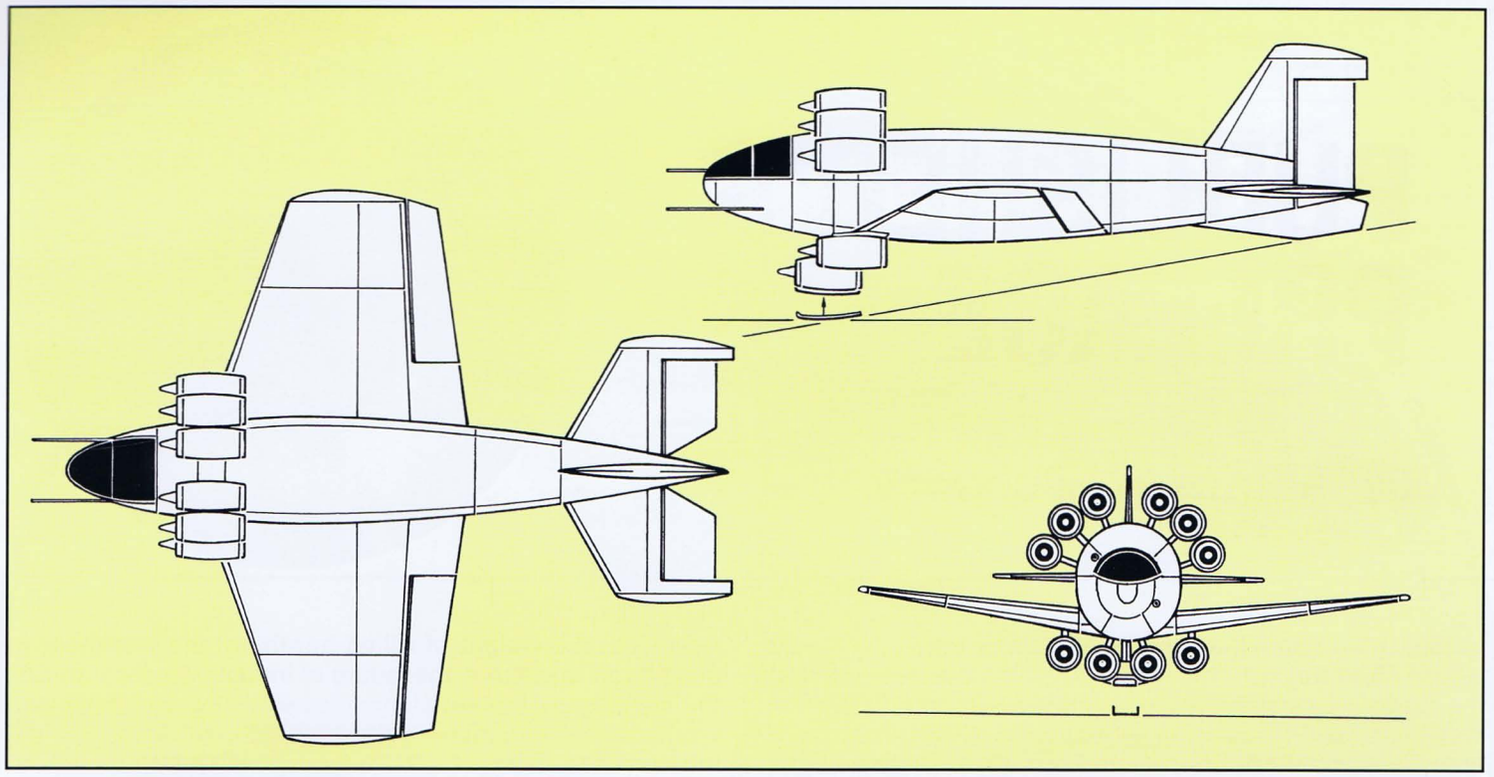
However, it must be appreciated that the potential of all of these projects lay with the powerplants they were to employ. The early reaction propulsion engines worked but were temperamental, thirsty, and generally short on performance and reliability. The BMW 003 and Junkers Jumo 004, two jet engines that reached full series production, required

Opposite: The world's first operational jet fighter following restoration by the National Air and Space Museum in 1979. This example, the Me 262 A-1a/R7, W.Nr. 500491, was one of approximately 1,933 Me 262s completed. Plans for more powerful versions of the Me 262 were well advanced by the end of the war.

* See *Jet Planes of the Third Reich,* by Smith & Creek, Monogram Aviation Publications, Boylston, MA, 1982.

** The Heinkel He 178 V1 first flew successfully on August 27, 1939.

† Reimahg (Reichsmarschall Herman Göring Werke) in Thüringen, central Germany.



Above: The Junkers Ju EFo 09 design study of the early 1940s envisioned a bullet-shaped fuselage surrounded by 10 Argus pulsejets and armed with two 20 mm cannon. It is difficult to imagine how its prone pilot would have endured the ear-splitting noise created by so many engines mounted so close to the fuselage!

considerable pilot skill and were plagued by frequent overhauls. The Walter HWK 509 liquid-fuel rocket had its own peculiar idiosyncrasies that the operator ignored to his peril. German engineers were, nevertheless, working on second, and third generation jet and rocket engines by the war's end. A key to producing these new engines was the development of new high-temperature alloys. Although they lacked stocks of certain raw materials needed to improve metallurgy, the Germans were surprisingly successful in overcoming such obstacles. Some of the new jet engines, being tested by March 1945, were significant improvements over the earlier models and undoubtedly would have greatly enhanced performance of the new aircraft projects. Air Chief Marshal Sir Sholto Douglas, who commanded the British Air Force of Occupation, told reporters: "The Luftwaffe had under development at least six types of jet and rocket-propelled planes superior to the Messerschmitt 262 and Arado 234. If the war had lasted another six months, things might have been rather nasty. I'm told some of their stuff is rather amazing."

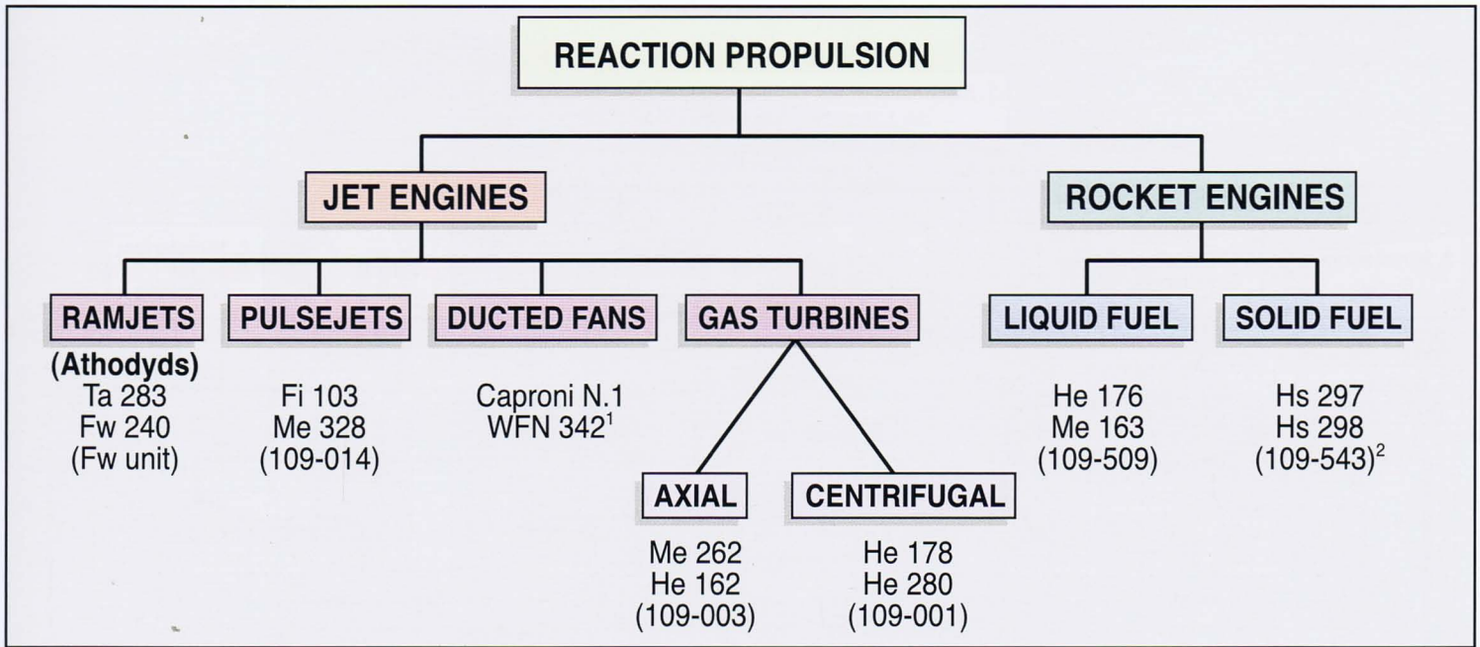
At this juncture, it is important to define the term "reaction propulsion" as it applies to aircraft. The chart on page 9 graphically depicts the two primary systems, jet and rocket propulsion. The jet engine category has four distinct branches:

• The ramjet, or aero thermodynamic duct (athodyd). The major drawback to this form of propulsion is that the ramjet engine cannot be started when it is stationary. It requires sufficient forward velocity in order for air to be rammed into the intake in an amount necessary to facilitate combustion and thrust. The ramjet has no moving parts and no means of controlling thrust. Because of these features, an aircraft solely powered by this form of propulsion must be launched from another aircraft, or assisted into the air by a take-off booster.

• The pulsejet, or impulse duct engine, as in the ramjet, cannot be started while stationary, but unlike the ramjet, it is fitted with moving parts in the form of a series of one-way vanes or valves mounted across the inlet. Fuel is injected into the combustion chamber, as in the ramjet, and is ignited. The resulting explosion forces the hot exhaust gases out the rear pipe; gases are prevented from escaping forward by the valves which are by then in their closed position. When the exhaust gas has been expelled from the combustion chamber, a decompression occurs allowing the forward valves to reopen to admit fresh air into the combustion chamber for the cycle to repeat itself; the repetition of explosions has a distinct sound of high resonance. The pulsejet or impulse duct engine, like the ramjet, has no means to control thrust.

• Ducted fan jet propulsion uses a conventional internal combustion engine mounted inside a long duct to drive a compressor composed of short propeller blades, as in a fan, with a ring of fuel injectors positioned further aft to heat the compressed air prior to it being discharged from the rear. No turbine is used in this engine, its function being performed by the internal combustion engine. Thrust was controlled by a bullet-shaped airfoil mounted in the tail which was moved fore or aft to regulate thrust. This form of propulsion, in its strictest application, has a very limited potential.

• The gas turbine is by far, the most successful category of reaction propulsion engines for aircraft. There are two basic gas turbine types: axial and centrifugal, of these two, the axial-compressor type proved to be superior. The centrifugal compressor type, has a single air impeller. In this arrangement, air is fed to the center of the impeller and is accelerated by being thrown outward by centrifugal force. The compressed air is then collected around the outer rim of the impeller by a diffuser which slows it down and increases its pressure before it is fed into the combustion chamber(s). In the axial type, air is fed directly through several rows, or stages, of compressors where it is further compressed before being fed into the various combustion chambers. In both axial and centrifugal types there is a



[1] The Italian Caproni-Campini N.1 jet first flew on August 27, 1940, powered by a Isotta-Fraschini piston engine driving a variable pitch ducted fan. The German WNF 342 helicopter was not a true ducted fan, but powered by a piston engine driving a compressor which delivered compressed air and fuel to each of the small rotor tip combustion chambers, where it was ignited. The resulting thrust generated enough power for the rotors to establish lift enabling flight.

[2] This power unit was a two-stage solid-diglycol rocket manufactured by Schmidding.

turbine wheel attached to the central shaft positioned aft of the combustion chambers, which provides the required power to turn the compressor. The axial is more complicated than the centrifugal type, but the axial flow jet engine is capable of offering much higher pressure ratios while requiring less frontal area due to its smaller cross section. Almost all gas turbines in use today are of the axial variety.

Some aircraft have been successfully flown using solid-fuel rocket motors, but the vast majority of rocket engines for manned aircraft operate with liquid fuels. Solid-fuel rockets have been primarily used in RATO (Rocket Assisted Takeoff) applications, and in the principal powerplant for guided missiles.

By early 1940, the German Air Ministry had devised a new means of identifying reaction propulsion engines. This system used the prefix "109" which was occasionally shortened to "9," followed by a hyphen, and by a three-digit number. Jet engines received numbers beginning with 001 extending up to 499. Numbers between 500 and 599 were reserved for rocket units. Thus, the Jumo 012 was officially the 109-012. The primary advantage to this system is that it does not readily disclose the manufacturer's identity. In this regard, after the BMW 003 made its appearance, the last, or end digit of the three identified the manufacturer:

1 = Heinkel (001, 011, 021)	6 = Heinkel (006, 016)
2 = Junkers (012, 022)	7 = Daimler-Benz (007)
3 = BMW (003)	8 = BMW (018, 028)
4 = Argus (014, 044)	9 = Walter (509)
5 = Porsche (005)	0 = Not used

The German reaction propulsion manufacturers also used one, two, or three letter abbreviations to identify the type of engine. They are summarized thus:

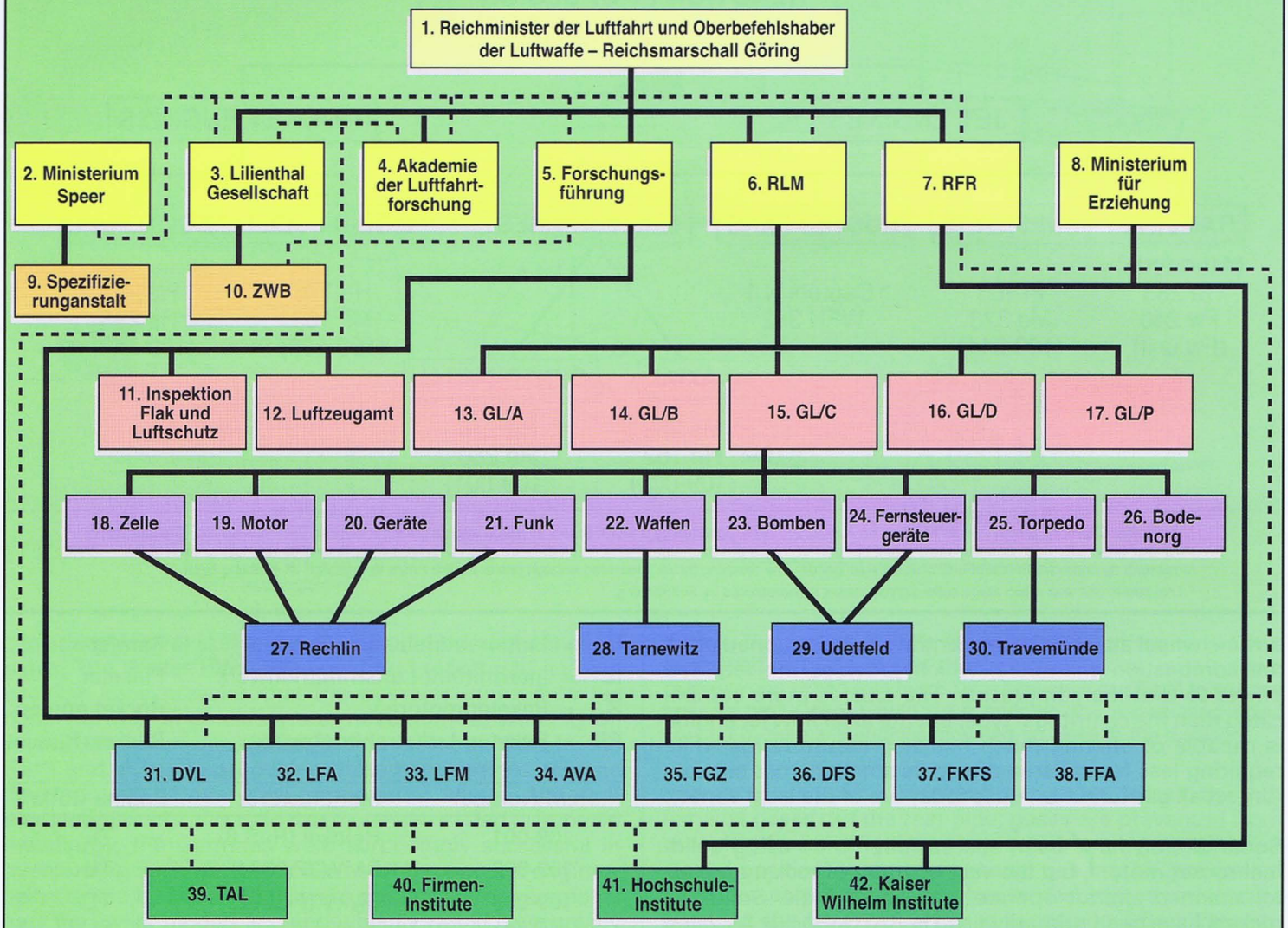
TL = Turbo-Luftstrahltriebwerk – Gas turbine
PTL = Propeller-Turboluftstrahltriebwerk – Turboprop
ZTL = Zweistrom-Strahltriebwerk – Dual flow jet
ML = Motor-Luftstrahltriebwerk – Ducted fan
L = Luftstrahltriebwerk – Ramjet
IL = Intermittent-Luftstrahltriebwerk – Pulsejet
R = Raketenmotoren – Rocket engine
RL = Raketen-Luftstrahltriebwerk – Rocket+Ramjet

RLM Number		Manufacturer		Engine Code
109-001	=	Heinkel (HeS 8)	–	TL
109-002	=	BMW (P 3304)	–	TL
109-003	=	BMW (P 3302)	–	TL
109-004	=	Junkers	–	TL
109-005	=	Porsche	–	TL
109-006	=	Heinkel (HeS 30)	–	TL
109-007	=	Daimler-Benz	–	ZTL
109-011	=	Heinkel (HeS 11)	–	TL
109-012	=	Junkers	–	TL
109-014	=	Argus	–	IL
109-016	=	Heinkel/DB	–	PTL
109-018	=	BMW	–	TL
109-021	=	Heinkel/DB	–	PTL
109-022	=	Junkers	–	PTL
109-028	=	BMW	–	PTL
109-044	=	Argus	–	IL

The delivery of new warplanes to the Luftwaffe generally followed a predictable path from start to finish. The chart at the top of page 10 entitled Aviation Command and Control Relative to Research and Development delineates the chain of command within the Luftwaffe and related agencies that influenced the introduction of new aircraft to the service units.

A specification for a new warplane was typically drawn up by the RLM. The impetus for aircraft specifications could have originated from the office of the Reichsmarschall, the RLM itself, or a collective of other influential government offices. The RLM was located in a large building in Berlin and was almost entirely staffed by military personnel that

AVIATION COMMAND AND CONTROL RELATIVE TO RESEARCH AND DEVELOPMENT



1. **Reichminister der Luftfahrt und Oberbefehlshaber der Luftwaffe** – General d.Fl. Hermann Göring
2. **Ministerium Speer**– Ministry of Armaments and War Production (headed by Albert Speer)
3. **Lilienthal Gesellschaft** – (Lilienthal Society)
4. **Akademie der Luftfahrtforschung** – (Aviation Research Academy)
5. **Forschungsführung** – Director of Research Planning
6. **RLM** – Reichsluftfahrtministerium (German State Air Ministery)
7. **RFR** – Reichsforschungsrat (German Research Council)
8. **Ministerium für Erziehung** – Ministry for Education
9. **Spezifizierunganstalt** – Specification Institute
10. **ZWB** – Zentralstelle für Wissenschaftliche Berichterstattung (Central Institute for Scientific Reports)
11. **Inspektion Flak und Luftschutz** – Inspector Anti-Aircraft and Air Defence
12. **Luftzeugamt** – Air Materiel Office
13. **GL/A** – Generalluftzeugmeisters/A (Luftkommando Amt - Air Command Office)
14. **GL/B** – Generalluftzeugmeisters/B (Allgemeines Luftant - General Aviation Office)
15. **GL/C** – Generalluftzeugmeisters/C (Technisches Amt - Technical Office)
16. **GL/D** – Generalluftzeugmeisters/D (Verwaltungsamt - Administration Office)
17. **GL/P** – Generalluftzeugmeisters/P (Luftwaffen-Personalamt - Air Force Personnel Office
18. **Zelle** – Airframe Testing Division
19. **Motor** – Engine Testing Division
20. **Geräte** – Instrument and Gunsight Testing Division
21. **Funk** – Electronics Testing Division
22. **Waffen** – Weapons Testing Division
23. **Bomben** – Bomb and Bombsight Testing Division
24. **Fernsteuergeräte** – Winged Guided Missile Testing Division
25. **Torpedo** – Airborne Torpedo and Mine Testing Division
26. **Bodenorg** – Ground Equipment Testing Division
27. **Rechlin** – Rechlin Eprobungsstelle (Aircraft Test Center 60 miles north of Berlin)
28. **Tarnewitz** – Tarnewitz Eprobungsstelle (Aircraft Weapons Proving Ground at the Baltic Sea)
29. **Udetfeld** – Udetfeld Eprobungsstelle (Aircraft Bomb Proving Ground near Gleiwitz)
30. **Travemünde** – Eprobungsstelle See (Naval Aircraft Test Center near Lübeck
31. **DVL** – Deutsche Versuchandstalt für Luftfahrt (German Experimental Institute for Aviation)
32. **LFA** – Luftfarht Forschungsanstalt (Aviation Research Institute)
33. **LFM** – Luftfarht Forschungsanstalt München (Aviation Research Institute at Munich)
34. **AVA** – Aerodynamusche Versuchsanstalt (Aerodynamic Testing Institute)
35. **FGZ** – Forschungsanstalt Graf (Graf Zeppelin Research Institute)
36. **DFS** – Deutsche Forschungsinstitut für Segelflug (German Gliding Research Institute)
37. **FKFS** – Flugmotoren, Kraftfahrtzeug Forschungsinstitut Stuttgart (Aero engine & Vehicle Research Institute at Stuttgart)
38. **FFA** – Flugfunk Forschungsanstalt Avionics Research Institute)
39. **TAL** – Techniche Akademie der Luftwaffe (Technical Academy of the Air Force)
40. **Firmeninstitute** – (Commercial Firms Institute)
41. **Hochschuleinstitute** – (Institute of Technical Colleges)
42. **Kaiser Wilhelm Institute** – (Coordinator of Ministry Directives)

Numbers Refer to notes.
Solid lines indicate direct control.
Dotted lines indicate Partial control, influence or association.

Above: The Reichsluftfahftministerium in the center of Berlin as seen from the corner of Leipzigerstrasse and Wilhelmstrasse. Completed by Ernst Sagebiel in 1936, it occupied an entire city block and reflected the architectural neoclassic style promoted by the Third Reich's chief architect, Albert Speer. The structure survived the war and was located in former east zone of Berlin. It was from this building that German Air Ministry planners oversaw the development of new aircraft.

reported directly to the Reichsmarschall; but Göring's position as the head of many offices was only nominal and actually many functions that were performed in his name were accomplished by the staff of the RLM. The Oberkommando der Luftwaffe — OKL (Air Force High Command) was part of the RLM. Once an official aircraft requirement had been drafted, the RLM passed the parameters of the new aircraft requirement to a select number of aircraft companies that the RLM believed could produce promising design studies. The RLM, after evaluating the submitted proposals, frequently narrowed the field of contenders to two firms. After further deliberations, a final choice was made and a build contract was issued. The winner of the competition and the Technical Office (number 15 in the chart) were notified. This office, the GL/C, also headquartered in Berlin, controlled development and procurement for the RLM. It also collaborated with research divisions through liaison officers sent from its development divisions (numbers 18 through 26). Its responsibility included not only aircraft but also weapon systems and avionics. Its actual design function was usually carried out through contracts and supervisory duties with individual firms. The GL/C also received assistance from the Director of Research Planning (number 5) who furnished fundamental studies on which to base the design, and assisted with expert consultant services to judge test results on prototypes. This agency, abbreviated to Fo Fü, was headed by four directors: Prandtl, Georgii, Seewald and Bäumker. Besides guiding research, they also oversaw the work of liaison officers sent from the GL/C.

The head of Technical Office from June 1936, was the later Generaloberst (General) Ernst Udet. Following Udet's death in November 1941, Generalfeldmarschall (General, 5-star) Erhard Milch assumed command. His tenure lasted until June 1944, when he was replaced by the controversial Generalmajor (Major General) Ulrich Diesing. Diesing was killed in an auto mishap on April 17, 1945, under unknown circumstances. No successor was named prior to the end of the war.

Once the selected manufacturer had built and successfully flown one or more prototypes of a new aircraft, these prototypes were assigned to various appropriate testing centers (numbers 27-30) where they were further evaluated by experts. All of this activity usually occurred prior to the new aircraft being accepted for frontline service with the Luftwaffe. However, as the war in Europe went against Germany, these procedures were shortened or eliminated altogether.

Perhaps the best-known Luftwaffe testing facility was Rechlin, where most of the new experimental jet and rocket-powered aircraft were evaluated. This base, located in Mecklenburg, about 60 miles (100 km) north of Berlin near Neustrelitz, was of great interest to the Allies, who regularly flew high-altitude reconnaissance flights over the base, beginning in 1944. The photographic results of these over-flights gave the Allies an advance look at number of new aircraft before they were encountered in the air.

To understand aircraft nomenclature in this work, it is both instructive and appropriate to briefly describe the German system of aircraft designations as they apply to this book. Aircraft projects began as design studies and advanced at the behest of the state, or as part of a specific internal company sponsorship. The various aircraft makers were free to devise and institute their own internal aircraft designation system. Most of these are readily understood, for example, the firm of Blohm & Voss began their system of Projekt (Project) designations with the BV P 1 gradually, over many years, reaching the BV P 215. Alterations to a particular project resulted in the P-number being amended (e.g., BV P 188.01-01, or BV P 188.04-01). The "P" for Projekt was also used by firms such as Dornier, Focke-Wulf, Heinkel, Henschel and Messerschmitt. The Arado company preferred to use "E" (Entwurf - Design) to identify their projects, as in the Ar E 580. Junkers favored the "EF" -Entwicklungs

Flugzeug (Development Aircraft) designation system (e.g., Ju EF 126). Most of these systems were similar beginning with a low number, but not necessarily number "1," and progressing to higher project numbers. In almost all instances after it was decided to develop a project into a flying prototype, the company project number was quickly replaced by a state Air Ministry number, that was issued by the GL/C office, and had either been preassigned to the firm or assigned at the moment a build contract was approved. Apart from general aviation sportplanes, there were only a couple of exceptions: the Ju EF 61 of 1936 and the Me P 1101 V1 of 1945. These retained their maker's project designation because the RLM had not authorized or sanctioned their construction.

German Air Ministry designations issued by the GL/C office consisted of two or three-digit numbers preceded by a two- or three-letter abbreviation of the makers name (e.g., Me 262, Ta 183). This list of designation numbers began with "10" and ultimately reached into the 600 block, but many were never assigned or used, particularly in the high numbers beyond 300. The larger German aviation firms received preassigned numbers in whole blocks from the GL/C office that could be assigned to aircraft at the firm's discretion. Yet, as the war progressed the Air Ministry exercised considerable latitude in reassigning numbers and issuing new ones. In this work, Manfred Griehl has documented for the first time many new Air Ministry numbers in conjunction with those select Focke-Wulf projects that were authorized for prototype construction.

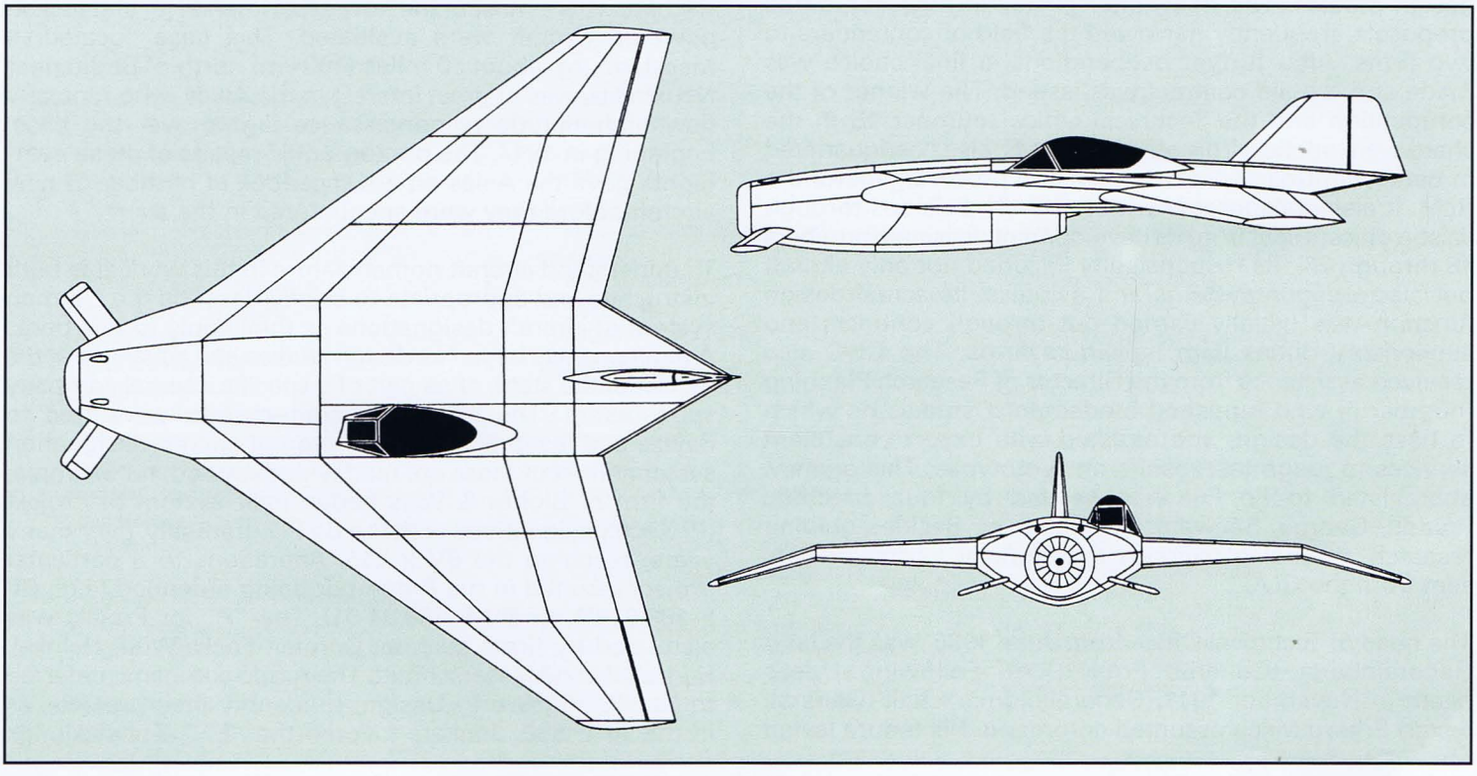
The first aircraft prototype for a new design always bore the suffix "V1" or "M1", V – versuch (test), or M – muster (model)§ as in the Ju 287 V1 or the Ba 349 M1. Once a new design was approved for series manufacture, it received an alpha-numeric designation which grew as the design evolved (e.g., Me 262 A-1, A-2, B-1, B-2, etc.).

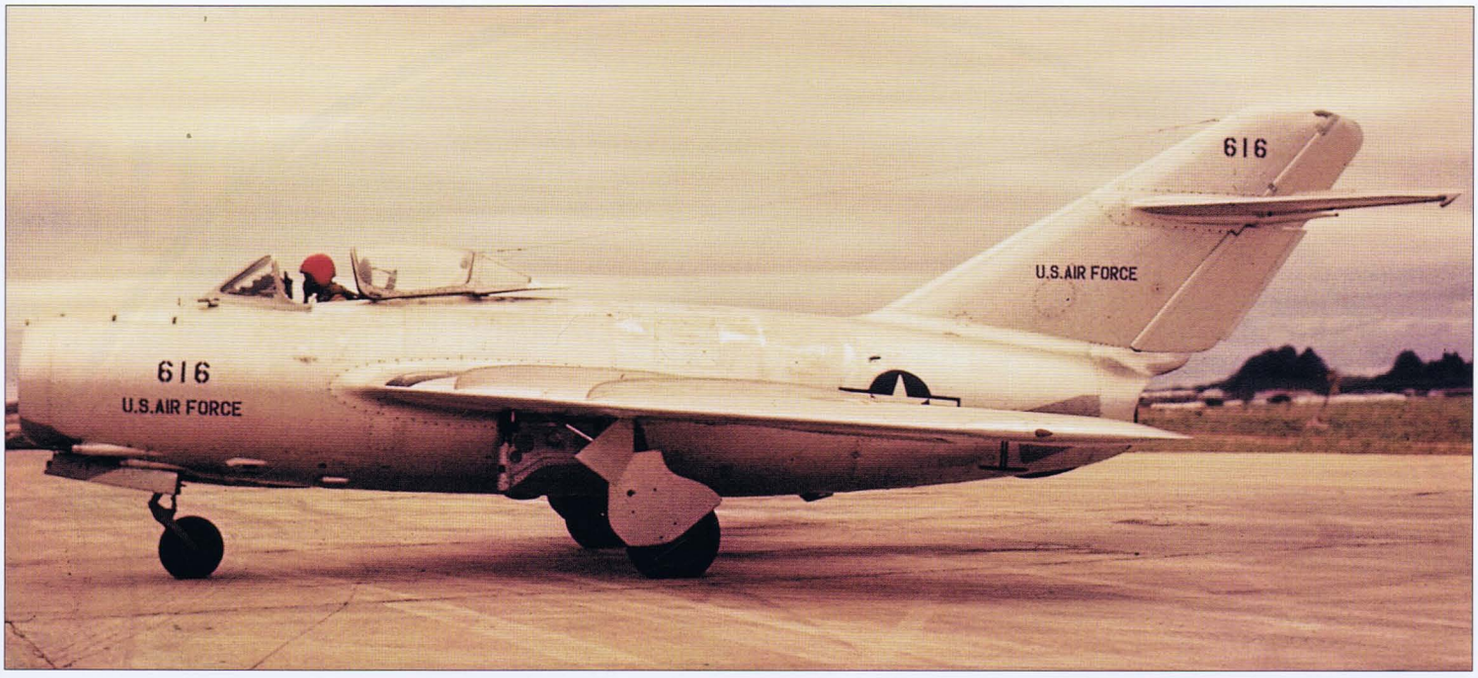
§ The "M" designations were favored by the Austrians and used by Bachem, Dornier and Heinkel.

In conclusion, the unusual design study, shown below, must be mentioned. It is widely attributed to the Blohm & Voss firm and is identified in postwar literature as the "Ae 607." Possibly this asymmetric canard delta-wing design originated from Blohm & Voss, however the identifyer "Ae 607" was not a project designation. The "Ae" numbers, found on Blohm & Voss documents, merely signify an internal company descriptive report. A search of surviving Blohm & Voss records fails to mention this design and it is not listed in the definitive Allied A.I.2(G) Report No. 2383, dated January 1946. A German historian has speculated that it could have been assigned a project number higher than P 215, the last known Blohm & Voss project. This speculation remains unconfirmed.

Finally, a rhetorical question must be posed. Who were the immediate beneficiaries of German wartime aviation technology? In addition to the United States one does not have to look any further than the Soviet Union and Argentina. When the Soviets seized Berlin, among the items they acquired was a duplicate set of blueprints for Kurt Tank's Ta 183. The Russians were so impressed by the design's potential and, spurred by Stalin's demands, they allegedly built a flying prototype of the German fighter (see p. 38). Undoubtedly, this research lead directly to the Soviet I-310 fighter of 1947. The I-310 was a brilliant achivement that entered service with the Soviet Air Force as the MiG-15, powered by a Russian copy of the Rolls Royce Nene 2, known as the RD-45. Two and a half years later, another jet fighter of German heritage took to the air for the first time also powered by the Nene 2. Designed by Kurt Tank at the invitation of Argentinean President Juan Perón, the I.Aé-33 Pulqui II (native indian for arrow) embodied many features of his wartime Fw 252 and Ta 183 fighter projects. However, whereas the MiG-15 was an immediate success, and was built in huge numbers, the Pulqui II was plagued by aerodynamic and political problems that conspired to restrict total production to six aircraft.

Below: A provisional general arrangement drawing of an unusual design, purported to have originated with the Blohm & Voss firm. First illustrated in the mid 1960s, its authenticity has never been proven.



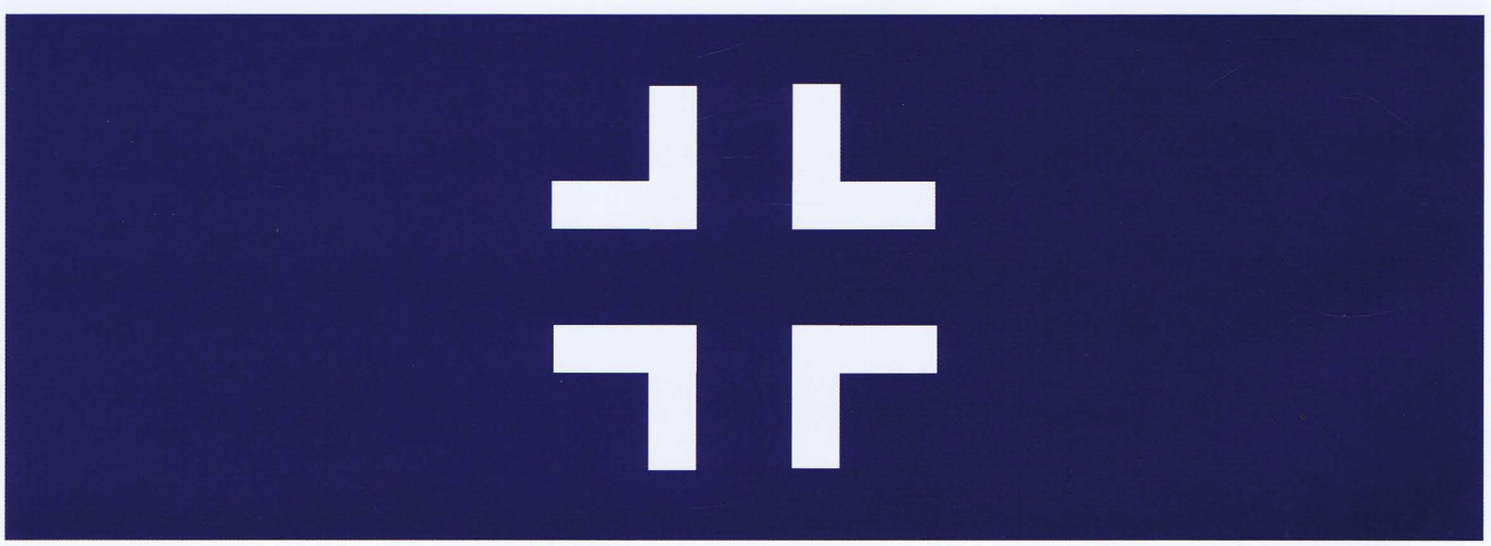


Above: MiG-15bis, c/n 2015337, ex red 2057, was purposefully flown to Kimpo air base on September 21, 1953 by defecting North Korean pilot Ro Kim Suk. It is shown here at Kadena airbase on Okinawa being piloted by USAF Capt. Thomas Collins. **Below:** The 6th prototype of the I.Aé-33, Pulqui II, currently on exhibit in Buenos Aires at the Museo Nacional de Aeronautica. Both of these jet fighters are direct descendants of designs created by the wartime German aircraft manufacturer, Focke-Wulf Flugzeugbau GmbH.

There were many other examples of postwar aircraft design influenced by the German wartime projects such as the American Bell X-5, the Russian Yak-15, I-270 and the Su-9. Some of these are identified in the following chapters.

	MiG-15bis	Pluqui II
Wing Span	33 ft 1 in (10,085 m)	34 ft 9 in (10,62 m)
Length	33 ft 2 in (10,102 m)	38 ft 0 in (11,60 m)
Height	10 ft 10 in (3,35 m)	10 ft 10 in (3,35 m)
Wing area	221.7 sq ft (20,6 m²)	270 sq ft (25,1 m²)
Empty weight	8,113 lb (3,681 kg)	7,920 lb (3,592 kg)
Takeoff weight	11,117 lb (5,044 kg)	12,210 lb (5,538 kg)
Max. speed	688 mph (1,107 km/h)	656 mph (1,057km/h)
Ceiling	50,840 ft (15,500 m)	46,588 ft (14,200 m)
Armament	1 x N-37 37mm cannon	4 x Oerlikon 20 cannon
	2 x NS-23 23mm cannon	


1



INTRODUCTION

By Manfred Griehl

From the beginning of the Second World War in Europe in September 1939, until the end of 1940, the European Allies alone faced the might of the German Luftwaffe. They came to appreciate the decisive influence airpower played in the conduct of the war. Apart from defensive tasks, the Luftwaffe was primarily a powerful offensive weapon during the period of the Blitzkrieg (lightning war) and during the initial campaign against Russia. However, the increasingly heavy air attacks mounted by the Royal Air Force (RAF) and the United States Army Air Corps (USAAF) against Germany eventually brought favorable results as the number of Allied aircraft participating in large-scale raids rose. Not only did Allied losses decrease, but the effectiveness of the attacks increased: modern methods of aerial navigation, improved targeting data, as well as the extended range of Allied fighter escorts dramatically increased the effectiveness of Allied air attacks on the Deutsches Reich.

While concentrated Allied air attacks on civilian population centers failed to produce the desired effect of crippling public morale, bombing of bottleneck industries, such as aircraft manufacturing, synthetic fuel plants and the communication network, proved exceptionally effective.

As the war reached its fifth and sixth years, Allied air attacks occurred over all areas of Europe controlled by Germany, and resulted in fewer German fighters being built. Production of vital aviation fuels decreased so much that it was difficult to mount and sustain an aggressive air defense (Reichsverteidignung – Reich defense).

Compared with the deteriorating situation in Germany, the output of the Allied aircraft industry was unaffected by shortages of raw material and the outcome of campaigns far from home. Thus, Allied operational strength steadily grew to unprecedented levels until the end of the Second World War.

German fighter units faced determined opponents who had powerful and modern Allied long-range fighter aircraft flown by superbly trained pilots. In particular, more reliable and powerful piston engines gave British and American fighters a considerable advantage. The Allies were far ahead of Germany in the field of high-frequency radio and radar systems that could operate well even in the most adverse weather conditions.

The Allies gained another advantage by positioning their air forces in a concentrated ring around the Deutsche Reich, each of which lay within the effective range of escorted Allied heavy bomber forces. In June 1944, the first Allied aircraft landed on forward airstrips on the Continent, bringing them closer to the borders of Germany. Nearly unlimited supplies and increased production gave overwhelming strength to Allied airpower. At that time, about 65 percent of the total air operations were directed against industry and communication lines, an additional 25 percent were so-called terror attacks, and 10 percent were nuisance and saturation raids. Over 80 percent of the attacks against industrial and communication targets were directed against the Luftwaffe's flying equipment, fuel production, and storage facilities, as well as the indispensable communication network.

One of the Allies' chief objectives was to weaken and deceive the German fighter defense force. In contrast to the tactics employed early in 1944, when the USAAF could only attack one target per day, there were, by the autumn of 1944 bomber formations of up to 500 heavy aircraft. The Allied air forces operated in detached units: several bomber formations, constantly changing course, often flew deep into the German Reich, with smaller formations breaking off at intervals.

To confuse the defenders still more, the Allies made use of feint attacks and countermeasures, such as the dropping of strips of tinfoil to jam the Luftwaffe's night fighters' radar, as well as that of the antiaircraft artillery, aircraft reporting, and ground control services.

The overwhelming production of the Allied aircraft industry easily surpassed combat losses, while operational strength increased steadily. In 1945, the Oberkommando der Luftwaffe (OKL – Air Force High Command) estimated that huge numbers of new aircraft would be produced in Great Britain and the USA. The OKL report indicated 30,000 bombers, more than 29,000 fighter aircraft, together with 4,900 Mosquitoes (to be employed as bombers and fighters), were expected to leave Allied factories and that the Soviet Union alone was able to produce more than 3,000 planes a month, including about 1,200 fighters.

Opposite: A large-scale model of the Me P 1101 V1. This innovative Messerschmitt project actually reached prototype status, but never flew before the end of the war.

The OKL also anticipated that new heavy bomber types would be entering service on the American side in increasing numbers, including four-engine bombers, with greater top speeds and ceilings; heavier bomb loads; and improved defensive armament. Many German commanders feared the imminent arrival of the new Boeing B-29 "Superfortress" and Consolidated B-32 "Dominator" in the skies over Germany although neither type was deployed in the European Theater of Operations (ETO).

Another realization was the certainty of still more powerful engines in Allied fighter aircraft, that would increase their top speed up to 530 mph (850 km/h). German military intelligence also obtained information on Allied jet aircraft such as the Bell P-59 and Gloster Meteor, but they did not believe that enemy jet fighters could appear over the Reich during the first months of 1945. Rather, it was felt these new fighters would be used to protect Anglo-American bomber bases.

All German intelligence compiled showed a worsening situation for 1945. Despite several highly regarded modern piston-engine warplanes, such as the Bf 109 K-4, Fw 190 D-9, and the Ta 152 C and H-series, Germany was unable to overcome the Allied war potential. New piston-engine types offering increased performance, such as the Do 335 A and B-series, the Ta 154B, or the Ju 388 J-1, would not be available in large numbers until after April 1945. Only Me 163 rocket interceptor, and the Me 262 A-1a jet fighter, saw active service with the Luftwaffe. Both types were mass-produced, but the lack of special fuel for the rocket-propelled aircraft forced the Jägerstab (fighter staff) and the OKL to terminate Me 163 production. Of the Me 262 A-1a and A-2a, more than 1,000 aircraft were turned out before April 1945. New gun sights, particularly the EZ 42, were expected to achieve a high degree of accuracy, at an increased range. This was particularly true of the EZ 42, which was fitted with an automatic deflection device. In addition, there were plans to introduce advanced blind-flying equipment in 1945.

The powerful MG 151/20, MK 103, MK 108 and MK 214 aircraft cannon were widely used, and a very few recoilless guns, such as the Sondergeräte (special devices) SG 115 and SG 116, were used experimentally. Only a few rocket-propelled antitank weapons, such as the Panzerblitz and Panzerschreck saw limited use on the Eastern Front early in 1945.

Nearly all other remote- or wire-controlled air-to-air weapons, such as the X 4, Hs 298, and Hs 117H, proved quite successful. There were, however, a lot of technical problems with fuses, guidance systems, and other parts. The only successful air-to-air missile used in combat was the R4M carried under the wings of the Me 262 A-1a/R1. Also, construction of air-to-surface weapons began in 1943, but only the remote-controlled bombs Hs 293, PC 1400X ("Fritz-X" or FX), and the flying bomb Fi 103 (V-1 Buzz Bomb) were found worthwhile and used operationally by the Luftwaffe.

The defense of the Reich (Reichsverteidigung) depended primarily on heavy antiaircraft guns of 88 mm, 105 mm, and 128 mm caliber, of which nearly ten thousand were employed around major targets throughout Germany. However, Flak (Flugabwehr Kanonen – antiaircraft guns) shells could only be effective against enemy bombers up to an altitude of approximately 26,250 ft. (8,000 m), although this range could, under certain conditions, be increased to about 32,800 ft (10,000 m), or rarely even to 39,400 ft (12,000 m), by a concentration of all three heavy Flak-gun types. Because of the number of attacking Allied aircraft, and the ever-increasing average ceiling of advanced bombers, it was often possible to overfly fire from the Flak-batteries. Despite occasional successes by German Flak units, their guns generally proved incapable of successfully defending industrial and military targets from enemy aircraft operating at altitudes of 29,500 ft (9,000 m) or more. The output of improved 88 mm guns (Flak 41), and especially the slowly increasing production of heavy 128 mm (Flak 40), guns with a range of about 48,550 ft (14,800 m), did not permit saturation fire above 32,800 ft (10,000 m). There were simply too few of these guns to seriously obstruct the Allied bomber forces.

The many difficulties in remote-control systems and numerous technical problems in the development of effective ground-to-air missiles made it impossible to install antiaircraft missiles along the four defense lines across western Germany. This would have required approximately 3,000 batteries of all types for the defense of about seventy large towns with a population of more than 100,000. If, instead of defending specific objects, the whole Reich could have been surrounded by an antiaircraft defense belt, nearly the same number of AA batteries would have been needed. Countrywide Allied airraids devastated German infrastructure. Key industries were repeatedly attacked, while other Allied bomber forces tried to destroy major communication lines. Despite moving into underground factories, the capacity of most aircraft manufacturers was either damaged or eliminated. Only a few of important aircraft types, such as the Bf 109 K-4, the Fw 190 D-9, and the Me 262 A-1a were delivered by the closing weeks of the war.

In view of the foregoing, the only hope of the German supreme command was to rapidly develop an advanced jet-propelled aircraft and remote-controlled missiles. These would be built in large numbers inside huge caverns or other bomb-proof structures. Beginning in 1944, such fortified production sites were under construction near Kaufering, Niedersachswerfen, and Mühldorf. The objective was to produce thousands of Me 262s, together with the necessary turbojet engines, within the safety of reinforced concrete. Some of the huge Industrie-Bunker (industrial bunkers) had a length of 1,200 ft (366 m), and a span of 220 ft (67 m), but they were not completed before the end of the war.

Nevertheless, those German designers engaged in the development of more powerful jets did not interrupt their work from small offices that were not bombed by the Allies, because they were located in more obscure areas, such as Bad Eilsen or Oberammergau in Bavaria. They proposed new methods of designing combat aircraft and their work influenced the design of today's secret weapons. Not surprisingly, a considerable amount of Germany's work disappeared during the closing days of the war; much was captured by Soviet forces and never seen again. Both sides East and West made good use of German war research and development, obtaining many new ideas and recommendations that profoundly influenced in the development of postwar aircraft.

The Author

Manfred Griehl, who has been actively involved in the study of the German aviation since 1965, is the author of over 150 articles, aircraft monographs and specialized books dedicated to the history of German aviation during the period of the Third Reich. Born in Mainz in 1952, the author is a non-commissioned officer in a reserve unit of the postwar Luftwaffe. He studied law at Johannes Gutenberg University and is currently a member of the Mainz Industrial Labor Court. Since his first work was published in 1978, the author has demonstrated an exceptional understanding of a diversity of German aviation topics which, together with an equally exceptional collection of documents, period photographs and other items, has earned him wide recognition well beyond Germany.

Acknowledgments

While writing this book, I was able to draw upon documents, drawings, and photographs from archives and several good friends. I am particularly grateful to the Bundesarchiv (German National Archives) in Freiburg, Breisgau, for their assistance in accessing certain vital documents. Deutsche Airbus Industire also allowed access to many authentic documents of the Focke-Wulf archives.

A number of enthusiasts supplied hitherto unknown material collected during their own specialized research. These include Hans P. Dabrowski, Joachim Dressel, Willy A. Fiedler, Hans Grimm, Fritz Hahn, Dieter Herwig, Bruno Lange, Gerhard Lang, Horst Lommel, Frank Marshall, Hans-Justus Meier, Joachim Menke, Dr. Sönke Neitzel, Dr. Werner Nolttemeyer, Wolfgang Pervesler, Peter Petrick, John Provan, Willy Radinger, Stephen Ransom, the late Prof. Dr. Ruff, Hans Sander, Hanfried Schliephake, Leo Schmidt, Franz Selinger, Günter Sengfelder, J. Richard Smith, Oliver Thiele, Fritz Trenkle, and Günther Wegmann.

The Segelflugmuseum (Soaring Flight Museum) located at Spitzerberg, Austria, kindly made available photographs of early jet engine evaluation sites in Austria. Additional assistance came from Eddie Creek, Willy Radinger, Heinz Riediger, Hanfried Schliephake, Franz Selinger, and James P. Silva.

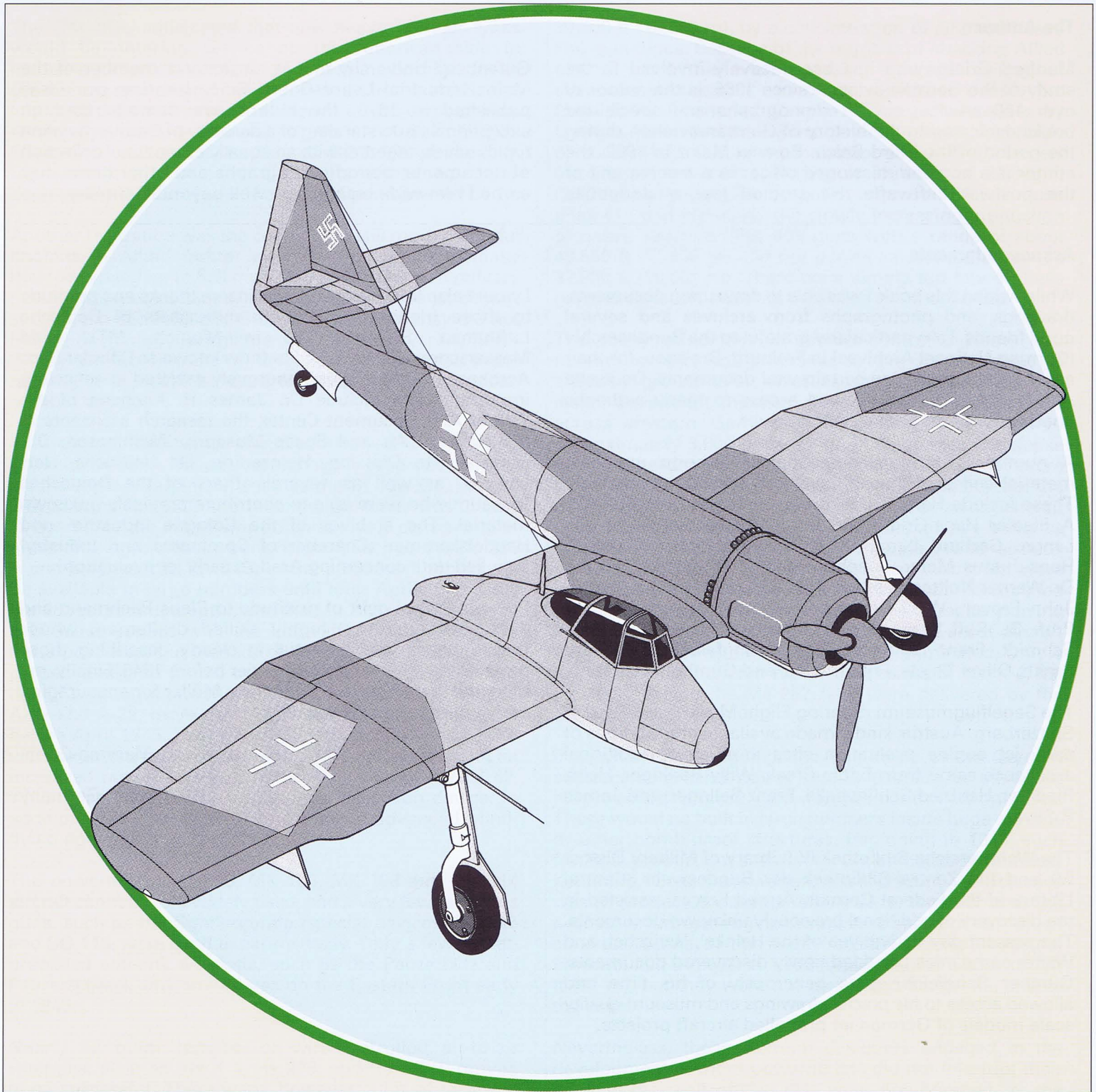
The Wehrbereichs-Bibliothek IV (Library of Military District IV) and the Zentral-Bibliothek der Bundeswehr (Central Library of the Federal German Armed Forces) assisted in the discovery of additional previously unknown documents. The present-day derivatives of the Heinkel, Henschel, and Walter companies provided newly discovered documents. Günther Sengfelder gave generously of his time and allowed access to his precise drawings and museum-quality scale models of German jet-propelled aircraft projects.

I would also like to express my sincere thanks and gratitude to those friends and aircraft enthusiasts of Deutsche Lufthansa, Siemens AG in Munich, MTU, and Messerschmitt-Bölkow-Blohm (now known as Daimler-Benz Aerospace). Others who generously assisted in collecting important data include Dr. James H. Kitchens of the Wright AFB Document Center, the research assistants at the National Air and Space Museum, Washington, DC, especially to Dipl.-Ing. Heinzerling, Dr. Heinrichs, Herr Limmer, as well as several others of the Deutsches Museum who were able to contribute previosly unknown material. The archives of the Cologne Industrie- und Handelskammer (Chamber of Commerce and Industry) supplied data concerning Arado's early jet evaluation.

I owe a special debt of gratitude to Claus Bachmann and Justo Miranda, two highly skilled draftsmen, whose thoroughness was essential in clearly describing those projects that existed only on paper before 1946. Finally, my personal thanks go to Frau Monika Müller for encouraging and supporting my research.

Manfred Griehl

Mainz , Germany



B&V

FOREWORD

By Hans H. Amtmann

It is indeed an honor to be asked to write a foreword to this new and fascinating book that brings back images from unforgettable times in my life. When I was asked by the publisher to write this foreword, I honestly did not know what to say and doubted that I would be able to find the right words, but when I looked at the contents of this captivating book, I discovered that it reviewed a time in which unprecedented progress was forced by circumstances of war. The German people are industrious and inventive, and they persistently pursue problems until one or more intelligent solutions are found, as is illustrated in this book.

The solutions had to be justified by basic research and this went on throughout the war in all major companies. Even Blohm & Voss, the company I worked for, which was a relative newcomer in the German aircraft industry, had a well-staffed and well-equipped research group with a subsonic wind tunnel. Our plans for a modern supersonic facility, unfortunately, did not come to fruition when the war ended everything, including my last job in the German aircraft industry. The following short poem fully expressed the hope and disappointment of the German population throughout the war years:

All through the war
The People were told
A secret weapon will unfold
To save the nation.

All through the war
The people were hoping in vain
For the miracle
That never came.

The belief in the rumor of "the imminent commitment of new and decisive miracle weapons" was widespread among the troops and even among the officers and even within the civilian population throughout the war. Many were waiting for the miracle weapon almost up to the last minutes of the war when everything was lost. A widespread expression among common people was "The Führer is still holding something in reserve!"

Opposite: Aviation artist, Keith Woodcock's impression of the asymmetric BV 237. This unusual project is emblematic of the highly innovative designs that flowed from the Blohm & Voss company during the war years. This project was never built, but plans were drafted to install a turbojet beneath the wing center section. The Blohm & Voss Monogram is shown at the base of the page.

In Germany, I lived through an important time in history, a time of peace under the reign of Kaiser Wilhelm II; when I was a child I vaguely remember The First World War, when my father was drafted into the uncertainty of war that ended with the Versailles Treaty and gave away German territory and its colonies; the time of preparation for my engineering profession; and the experience of the Hitler regime. The rapid political growth of the NSDAP National Sozialistische Deutsche Arbeiter Partei – NSDAP (National Socialist German Workers Party), generally known by its acronym as the Nazi Party and the excitement of meetings of all political parties was the direct consequence of the Great War (the First World War), and the Treaty of Versailles in which the Allies did not negotiate, but instead dictated Germany's fate.

The fantastic organization of the Nazi Party at that time kindled an enthusiasm, especially in the youth, that I had never seen before. This enthusiasm became a way of life during the first years of the regime, because work was provided for everyone, including the entire industrial complex and, especially for the ailing aircraft industry. When Hitler became chancellor, I was employed at the Heinkel Company on the Baltic at Warnemünde in the newly established pre-design department. At that time Blohm & Voss, the well-known German shipbuilder, began an aircraft division with Dr. Richard Vogt as its chief designer. This attracted me because the plant was located in Hamburg, my home. I started working there in January 1934. It was a new company and Dr. Vogt had to assemble his entire engineering staff, a difficult task at that time, because experienced aircraft engineers were hard to find. Due to my previous experience at Junkers and Heinkel, I became chief of pre-design after only a few months; a position I held up to the end of the Second World War. Under the creative spirit of Dr. Vogt, this small company grew and became well known for the inventiveness and originality of its aircraft designs. Some of the projects of that time are included in this book.

Politically, the first years of the Third Reich were times of crises. Hitler rectified some territorial wrongs of the Versailles treaty by military operations that were greeted by the German populace with enthusiasm; meanwhile France and England acquiesced. The German annexation of Austria in early 1938, apparently was anticipated by the British who did not react. Later that year came the Czech crisis in which England played the role of mediator and

that resulted in the Munich Agreement. From this meeting with Hitler, British Prime Minister Chamberlain brought back a peace pact with Germany, that nearly everyone viewed with considerable skepticism. Following this pact with England, came the arrangement of a German pact with the Soviets that stunned the nation because it marked a complete reversal of the stated anti-Communist policy of Germany. This action, however, was generally received well by the public, despite some justifiable suspicion, because it secured Germany's eastern frontier. When these actions elicited no strong reaction by either France or England, Hitler confidently attacked Poland under the pretext of gaining back the so-called Corridor and the German city of Danzig. Because England had signed a nonaggression pact with Poland, the German invasion forced England to declare war on Germany, a response that was not anticipated by Hitler and caught him unprepared for its consequences. France followed suit and this marked the beginning of the Second World War in Europe.

After a short waiting period in which the combatants accelerated war preparations, the first air raids on German territory occurred. These were mainly terror raids against civilian targets. Nevertheless, the German people believed hostilities would not last very long, and their prewar enthusiasm for the Hitler government was carried over into the war effort.

When the war began, the new German Air Force was comprised of proven but vintage warplanes, which had to be quickly replaced by newer and better machines. The aircraft industry submitted an amazing number of designs to the German Air Ministry for evaluation, which had to be backed up by basic research. As I recall from nationwide conferences I attended, new ideas and the intensive research results, mainly in aerodynamics and structures, were presented and discussed by all major companies. Such conferences periodically occurred throughout the war years.

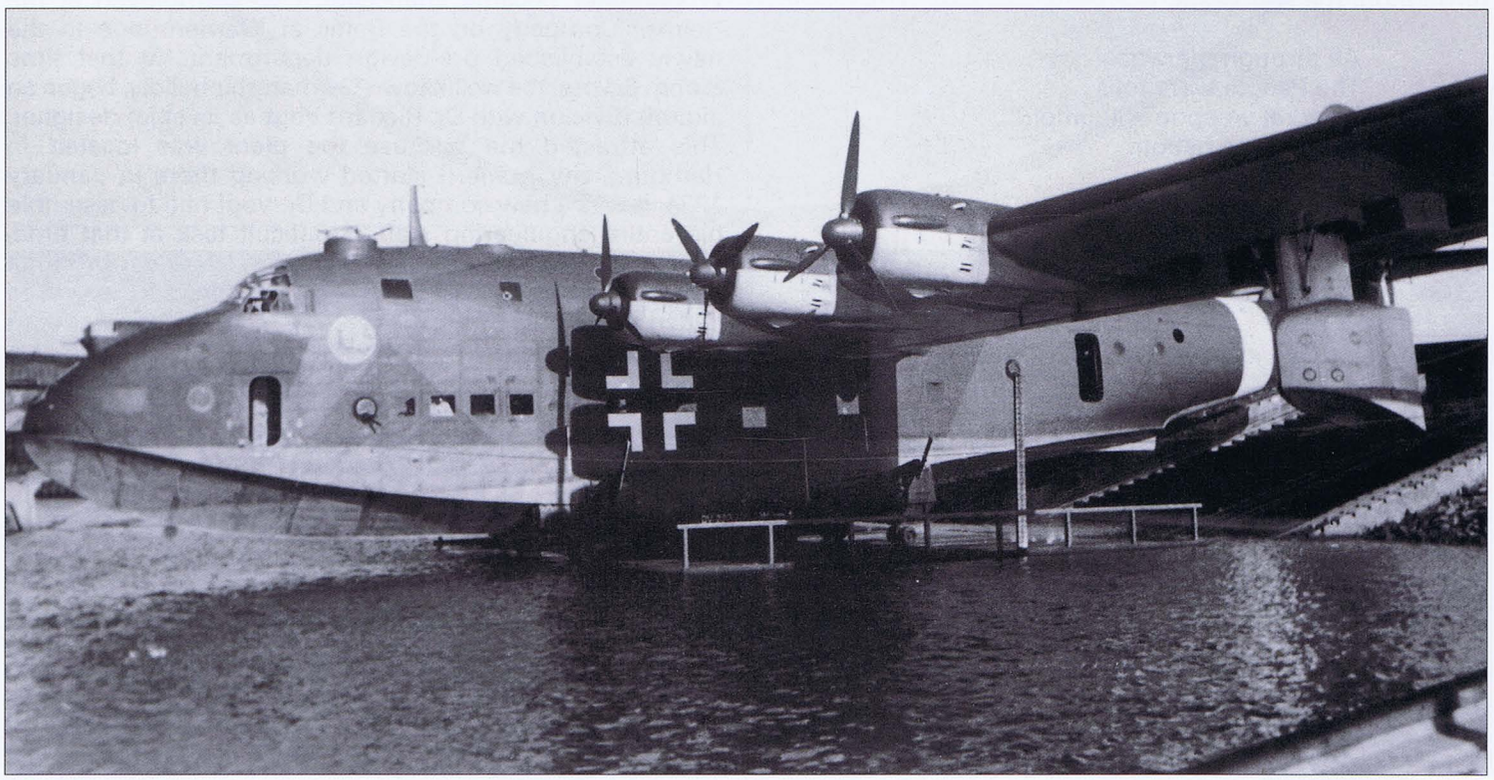
Everyone was closely watching the progress of the war, especially when German armed forces, supported by the Air Force, were so unbelievably successful during this period known as the Blitzkreig. In our office at Blohm & Voss, the enthusiasm of the employees was similar to that seen at the beginning of the Hitler regime. This was especially true following the early successes achieved by the German U-boats, built at the Blohm & Voss shipyard.

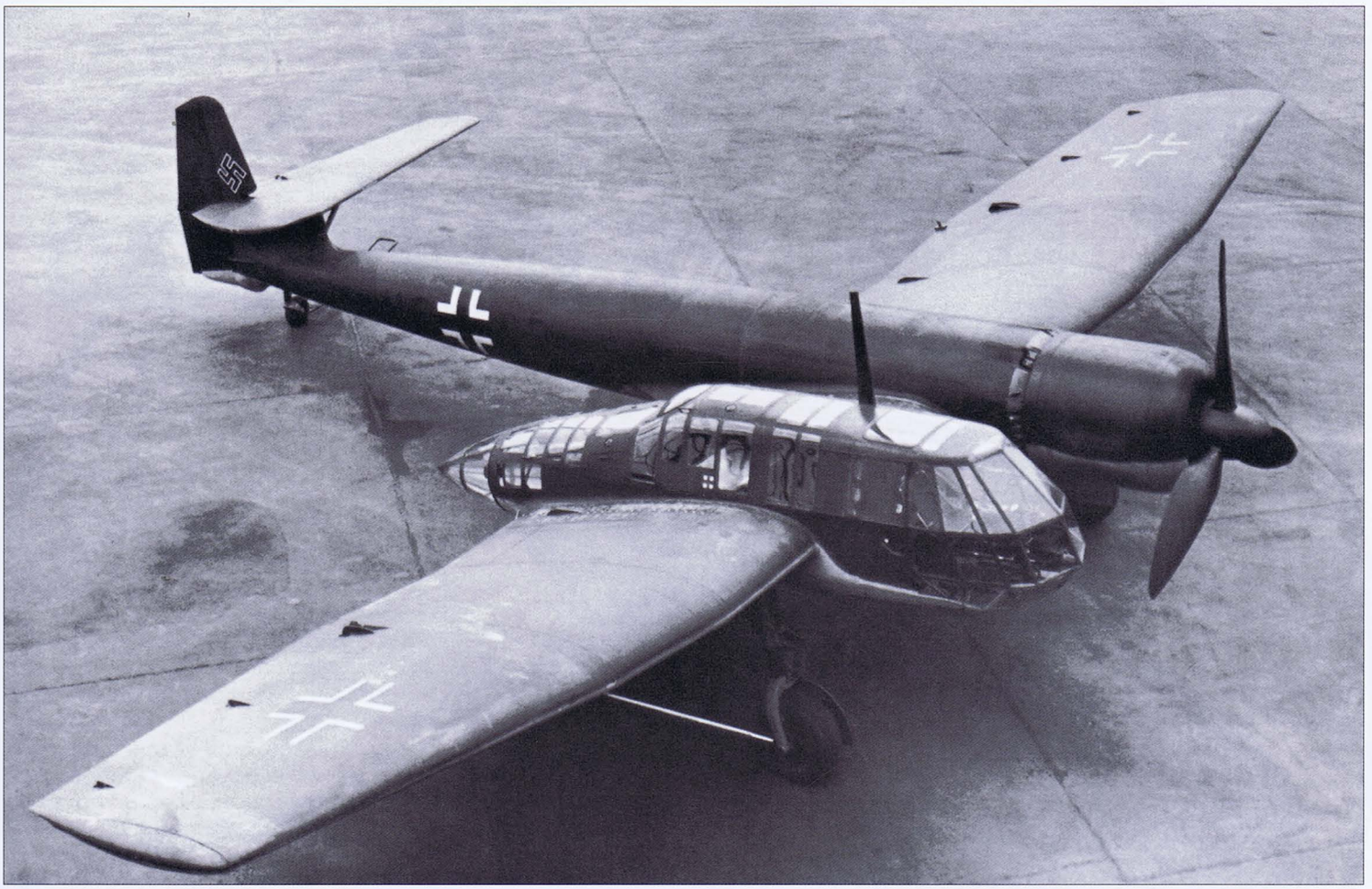
In spite of all these military victories and advances on the Western Front, there was a constant power struggle within the hierarchy of the government that was not conducive to the war effort. Nevertheless, these internal struggles had little effect on the output of new designs coming from the technical departments of the various aircraft companies.

The invasion of the Soviet Union in June 1941, was a shock for the entire nation as well as a foreboding of very difficult times, because people were uneasy about the successful prosecution of a two-front war even with the initial successes. By the winter of 1941, the large-scale advances had come to a halt, thereafter followed by one crushing reverse after another on all fronts. More and more submarines were lost, the tragedy of Stalingrad, the loss of North Africa, the landing of Allied troops in Normandy, and the increase in massive day and night bombing raids on German industry and population centers were blows from which recovery seemed impossible. The precarious political situation at the time of a well-publicized attempt on Hitler's life had dire consequences for the military but had no effect upon the industrial design work, or the output of war materiel. However, public morale in the workplace and at home suffered considerably. It was indeed a harbinger of more difficult times to follow.

Toward the end of the war, from his underground bunker in Berlin, Hitler had decreed a scorched-earth policy for the whole nation. If carried out, this would have been the end of

Below: A close-up of the six-engined BV 222 V8, W.Nr. 0008, X4+HH, while serving with LTSta See 222. The BV 222 began its career as a prewar civilian transatlantic seaplane but, before it could enter service it was modified to perform maritime reconnaissance duties with the Luftwaffe. This flyingboat was shot down on December 10, 1942 by British Beaufighters. Known as the Wiking (Viking), fewer than 20 examples of this successful long-range reconnaissance aircraft were built.





Above: Created by Dr. Richard Vogt of Blohm & Voss, the asymmetric BV 141 was employed on a limited scale as a reconnaissance aircraft. In spite of its odd design, crews were enthusiastic about its excellent flying qualities. This example, the BV 141 V11, W.Nr. 100003, NC+RB, was the third B-series aircraft manufactured (B-03).

any future German industry and a disaster for the population. This order, as cruel as it was, would have been carried out by fanatic party members if not for a few courageous and sane officials within the government, who, by risking their lives, prevented the execution of this edict.

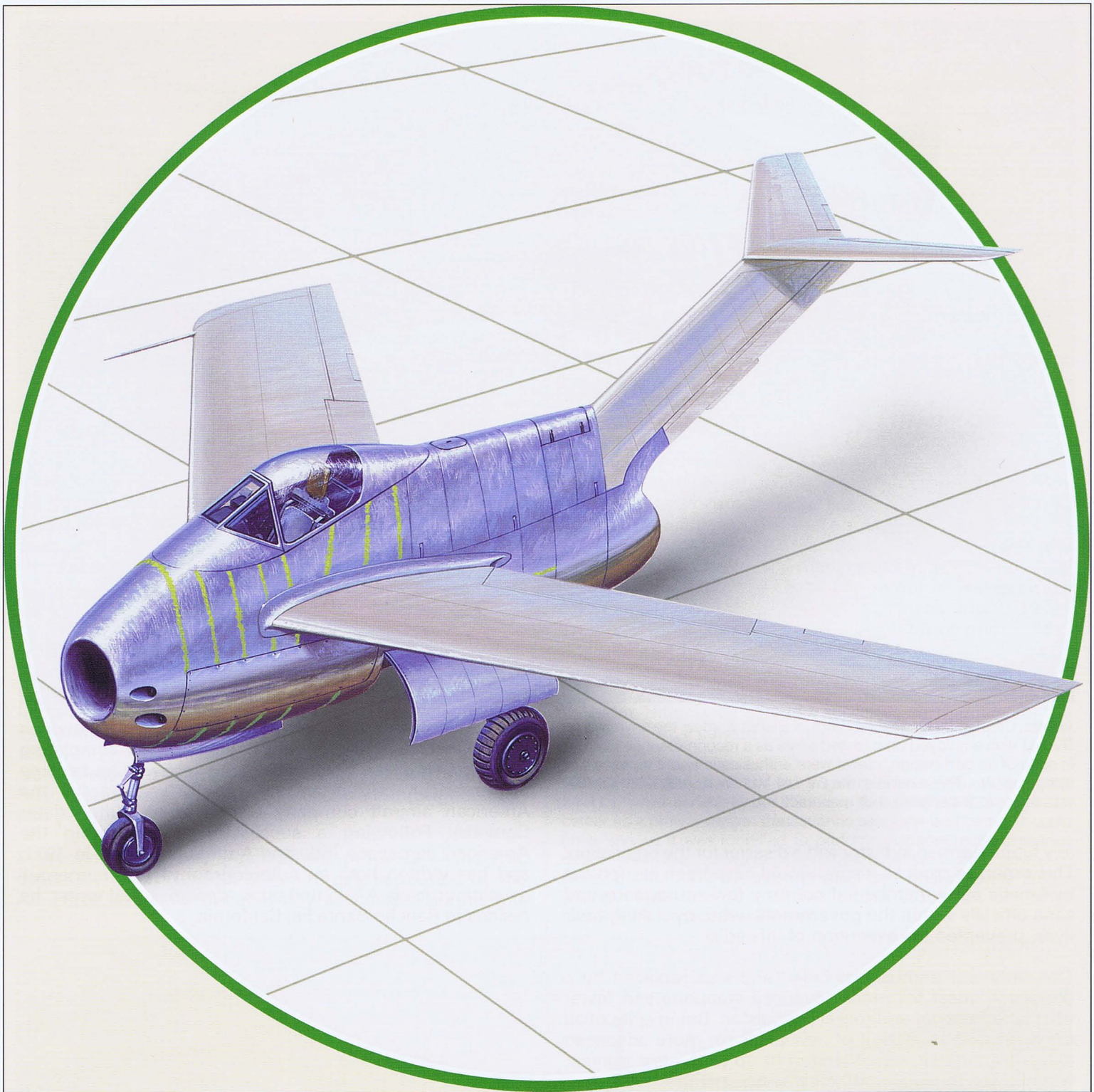
The early war enthusiasm faded and was replaced by a desperate quest for more advanced weapons and faster warplanes with jet and rocket propulsion. But in spite of all the disasters, the output of new ideas for more advanced weapons continued unabated right up to the last minute, when it was too late, and defeat was inevitable.

On May 8, 1945, the war in Europe was over, and with the end of the war, German wartime production of the advanced secret projects so well documented in this book also ended.

Hans H. Amtmann

Hans H. Amtmann was born in 1906, and came to America after the war as part of Project Paperclip. After completing his initial short-term contract, and a renewal, he became an American citizen and eventually worked for the American aircraft company Consolidated Vultee (later Convair). Following a successful career within the American aerospace industry, Amtmann retired in 1971, and has written both an autobiography‡ and numerous aviation articles. A talented artist, designer, and writer, he resides in Rancho Santa Fe, California.

‡ See *The Vanishing Paperclips, America's Aerospace Secret, A Personal Account,* by H. H. Amtmann, Monogram Aviation Publications, Boylston, MA 1988.



DAY FIGHTERS

1

Introduction

The primary focus of virtually the entire German aircraft industry during the Second World War was the creation of high-speed fighter aircraft, although in the time available it was not possible to complete a fraction of these projects before the end of the war. While the productive Focke-Wulf company was engaged in the construction and development of its advanced Flitzer (Dasher) and Ta 183 projects, the equally inventive Blohm & Voss and Heinkel companies contributed their own design studies of single-seat fighter aircraft. The world-famous Messerschmitt firm became Focke-Wulf's most determined competitor when both companies submitted their latest high-speed designs to the Chef Technische Luftrüstung (TLR) (Chief, Technical Air Armament) in late 1944. Thus the single-seat Messerschmitt P 1101 variable swept-wing fighter and, the rakish P 1110 entered the last fighter manufacturers' competition in Germany. A top speed of between 620 mph (1,000 km/h) and 745 mph (1,200 km/h) was anticipated after some design revision. In addition to these designs, a tailless fighter plane was also entered in competition with the Messerschmitt P 1110. A high-speed aircraft development study of the Me 262, known as the Me 262 Hochgeschwindigkeitsflugzeug was also proposed but eventually rejected early in 1945.

The firms of Heinkel, Horten, Junkers and Messerschmitt also designed a variety of twin-engine day and night fighters, fast interceptors, and several tailless aircraft. Due to the desperate situation of the German aircraft industry during the last year of the war, these designs never entered production. Production of the BMW 003 turbojet was limited because of several technical shortcomings. The Junkers engine works (Junkers Motorenwerke – Jumo) at Dessau did not finalize the design of their improved Jumo 004C and D turbojets until May 1945. Other heavy propulsion engines, such as the Jumo 012, never went beyond the experimental stage.

Nevertheless, the desperate German leadership still hoped to win the war by introducing large numbers of small midget fighters to be piloted by teenagers. The Hitler Youth (Hitler Jugend – HJ) supported by the National Socialist Flying Corps (National-sozialistisches Flieger Korps – NSFK) would have been recklessly sacrificed by unscrupulous SS commanders, but thanks to the efforts of General (Lt.-General) Adolf Galland, this hopeless enterprise was halted before it had progressed very far.

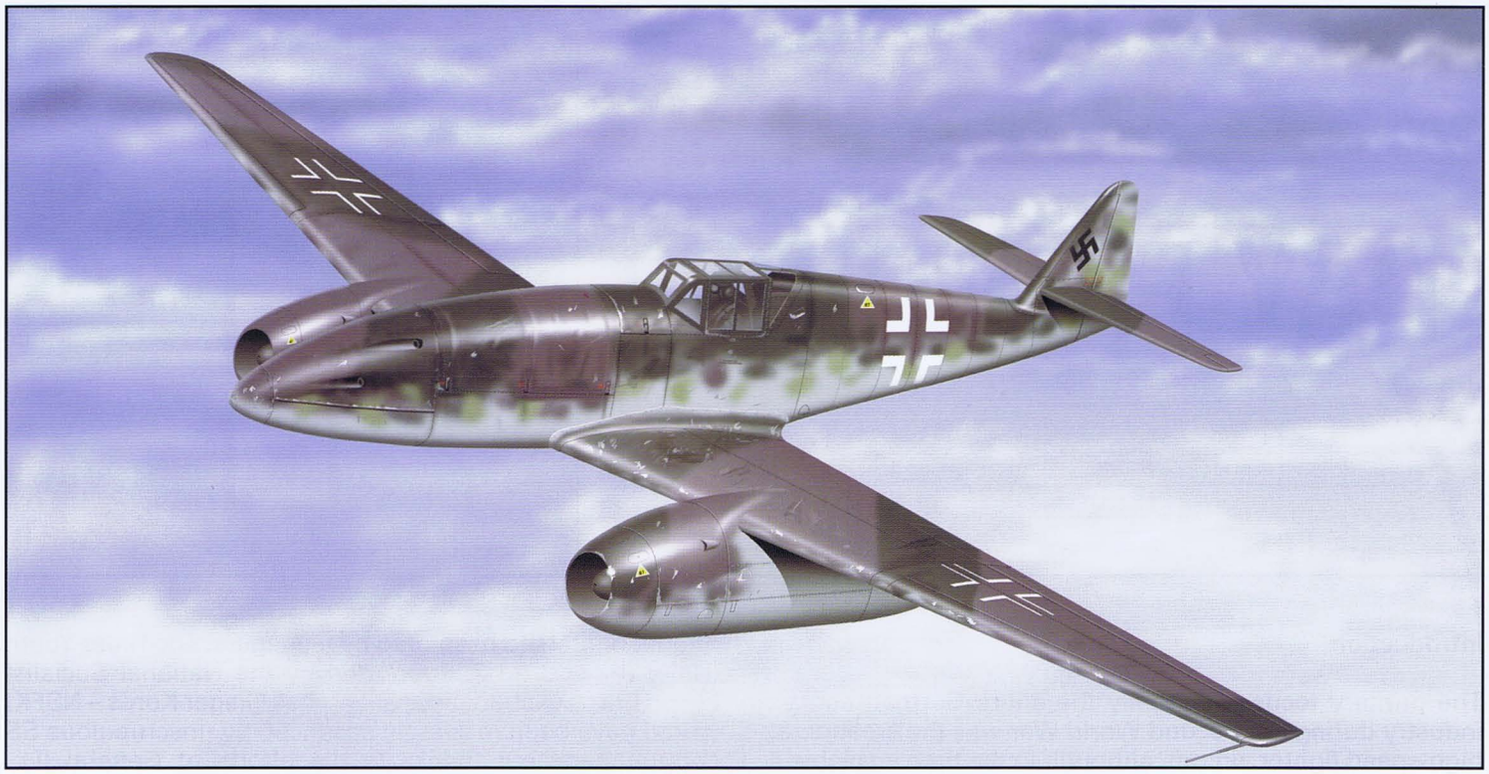
Opposite: Aviation artist, John Amendola's superb impression of the first prototype of the Ta 183. The aircraft was to have had mixed construction employing wood wherever possible such as the wings and tailplane.
The Operational Flying Clasp for day fighter pilots is shown at the base of the page.

Piston Fighters with Additional Jet-Propulsion

In addition to manufacturing jet fighters powered solely by the jet engine, design studies were first advanced to convert two standard leading piston-engine fighters of the period into turbojet-propelled aircraft. Late in 1942, Messerschmitt engineers at Augsburg investigated the feasibility of modifying the Me 155[1] project by substituting two jet engines known as TL Triebwerken (TL = Turbinen-Luftstrahl – turbojet) for the piston engine. The proposed twin-engine aircraft was intensely studied early in 1943, when orders were given to investigate the possibility of the simultaneous production of both the piston engined Me 309 and turbojet- driven Me 262 fighters. At the same time, the Air Ministry issued orders to reduce the number of differing aircraft types under development. Messerschmitt engineers had established that there was no fundamental problem with the installation of two Jumo T1 turbojet units under the wings of the Me 155. But this project was considered only as a shortcut solution. The calculated performance data appeared to match that estimated for the definitive Me 262. The proposed armament consisted of two MK 103s with 100 rounds per gun and one MG 151/20 with 170 rounds. It was thought possible that two additional MK 108s could be installed in both wing roots. The fuselage, wings and general equipment were essentially standard components of the Me 155, and the nosewheel was adapted from the Me 309. However, the rear fuselage, complete tail section and weapons installation would prove difficult to integrate. It was also recognized that a stronger wing and new fuel tanks would have to be constructed.

At first glance, when compared with the Me 262, the Messerschmitt Me 155 with two jet engines showed seemingly only minor differences. Visibility from the cockpit and the structure of the wings was decidedly dated and unsatisfactory. The number of available standard

1 The Me 155 was originally conceived as a naval development of the Bf 109 whose main characteristic was an entirely new wing with inwardly retracting main undercarriage legs.



components to be incorporated into the Me 155 TL design was limited, and since an extensive flight test program was inevitable, the German Air Ministry (Reichsluftfahrtministerium – RLM) lost interest in the project during the course of 1943.

Focke-Wulf also investigated the possibility of converting their highly successful Fw 190 A piston fighter into a jet-propelled aircraft. The Fw 190 TL (Fw 190 with jet engine) was proposed toward the end of 1942. It was to be fitted with a turbojet having a two-stage centrifugal-flow compressor, an annular combustion chamber and a single-stage turbine. The fuel was injected downstream and the exhaust outlet was also annular, the gases being ejected over the fuselage surfaces. How the pilot would have insulated himself from the hot exhaust would clearly have been a daunting challenge!

Compared with the Fw 190 A-3 powered by one BMW 801D piston engine with a top speed of 432 mph (695 km/h), the jet fighter was expected to reach a speed of 528 mph (850 km/h) at about 19,700 ft. (6,000 m). The design included a proposed fixed forward armament of two MG 17s in the fuselage and two MG 151/20s each in both wing roots. Flight endurance was calculated to be just over one hour. The climb rate of the Fw 190 TL at 100 percent thrust was much superior to that of the Fw 190 A-3. Due to the fighter's insufficient range and a lack of suitable jet units, development of this project was stopped in 1943.

Jet-Propelled Day Fighter Aircraft

Single-jet fighters

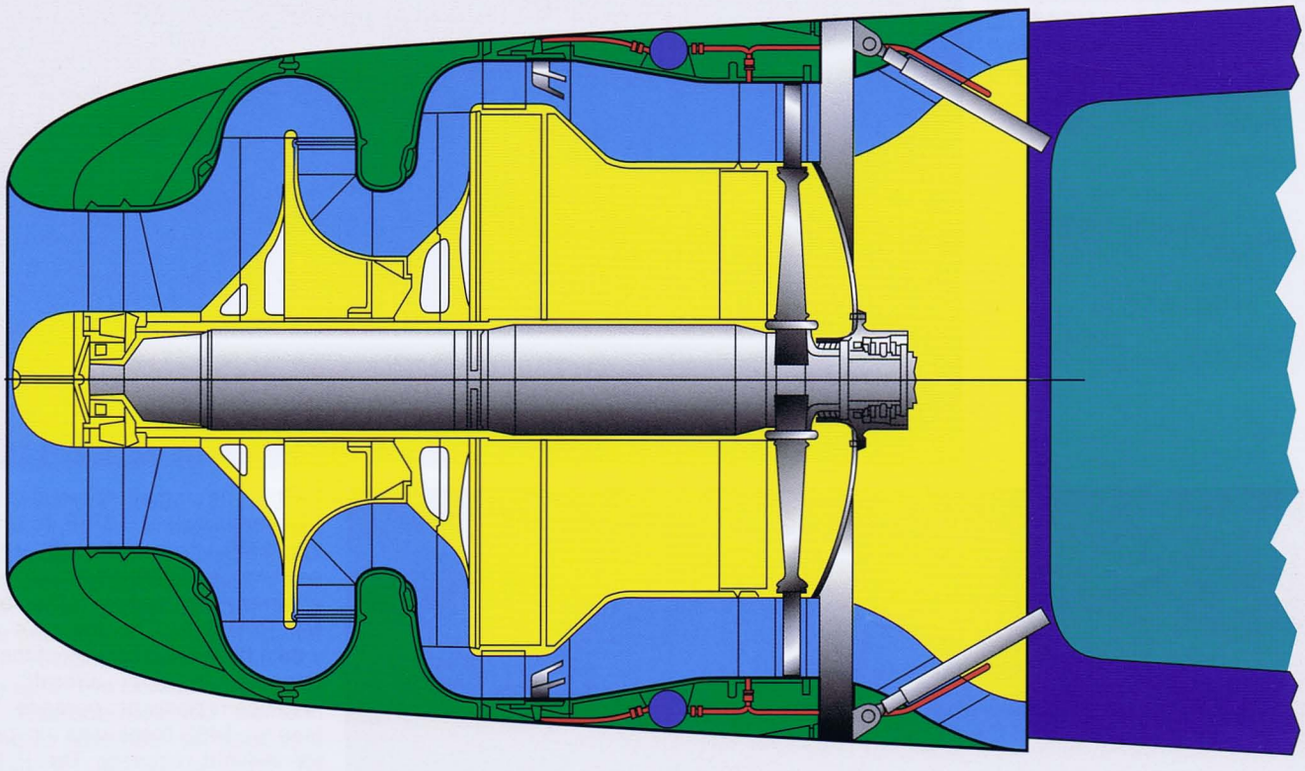
Preliminary design studies of the Messerschmitt Project P 65 (later redesignated P 1065), of which several different single-seat versions were considered, and the Messerschmitt Project P 1073 Bordjäger (a small parasite interceptor carried by a large aircraft) were undertaken simultaneously. After numerous design studies were investigated, it was found impossible to design a suitable long-range carrier aircraft, work on this project ended. Development of single-seat, single-engined designs was considered less urgent, resulting in a concentrated effort in

Above: Aviation artist, Tom Tullis's rendering of the proposed Me 155TL. In its original form, the proposed Me 155 was a propeller-driven aircraft heavily based upon the standard Bf 109 but incorporated an entirely new wing and other refinements. Adapting this Messerschmitt project to the jet age would have been feasible, but of questionable merit.

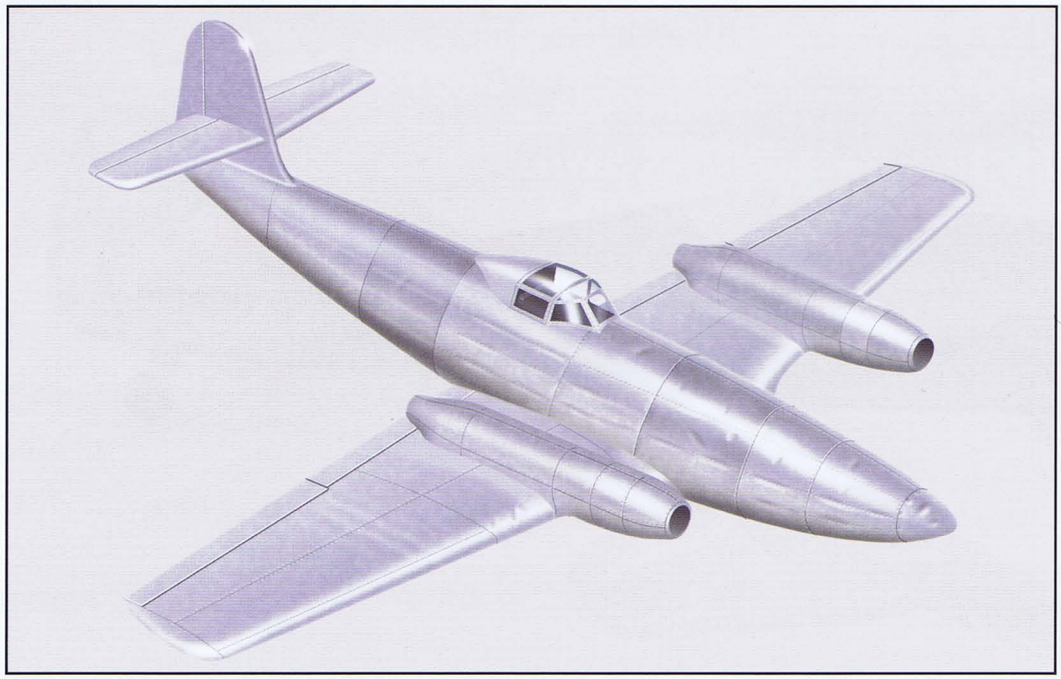
developing the twin-jet Me 262. When it became obvious that the number of jet engines which had actually reached production status was quite modest, and that these would never keep pace with the planned large output of modern fighters considered to be necessary, development of Messerschmitt's P 1092 1-TL Flugzeug (single-jet aircraft) powered by only one Jumo 004C turbojet, commenced. Preliminary drawings made by Herren Karl Eberhardt, Hans Hornung and Woldemar Voigt were finalized early in August 1943. They revealed a jet fighter powered by one Jumo 004C, a first step toward the later P 1101. It was calculated that this aircraft could attain a maximum speed of 565 mph (910 km/h) at an altitude of 19,700 ft. (6,000 m). Endurance was to be two hours at 29,500 ft. (9,000 m), with a range of 620 miles (1,000 km). Three different designs of a so-called Normaljäger (standard fighter) having wingspans of 41.7 ft. (12,70 m) or 47.4 ft. (14,45 m) and a Höhenjäger (high-altitude fighter) were finalized in 1943. In order to reduce the weight of the Höhenjäger, armor protection was abandoned and the fixed armament reduced to one MK 103 and two MG 151/20s while the offensive armament was reduced. Maximum ceiling was calculated at 36,000 ft. (11,000 m) or 42,650 ft. (13,000 m) depending on the equipment installed. Early in July 1943, Dipl.-Ing. Hornung prepared a comparison between the tailless project Li P 20, designed by Alexander Lippisch, the twin jet P 1065, and the P 1092. It was discovered that the P 1092 required only 55 percent of the material and about 90 percent of the manpower required for the Me 262. However, responsible RLM officials considered Messerschmitt's twin-jet fighter to be superior primarily because it could carry two bombs and had a larger fuel capacity.

During July 1943, two more designs were completed, of which the first had the wings of the Me 262, but with the

Above and below: The propeller-driven Focke-Wulf Fw 190 A-3 would have formed the basis for the projected jet-powered version, the Fw 190 TL. The proposed turbojet would have been an early centrifugal type in which the hot exhaust gases would have been discharged over the entire fuselage. It is difficult to believe this system could have worked considering the many problems that would have resulted from such an installation. In particular, it is unclear how the cockpit was to be insulated and ventilated.

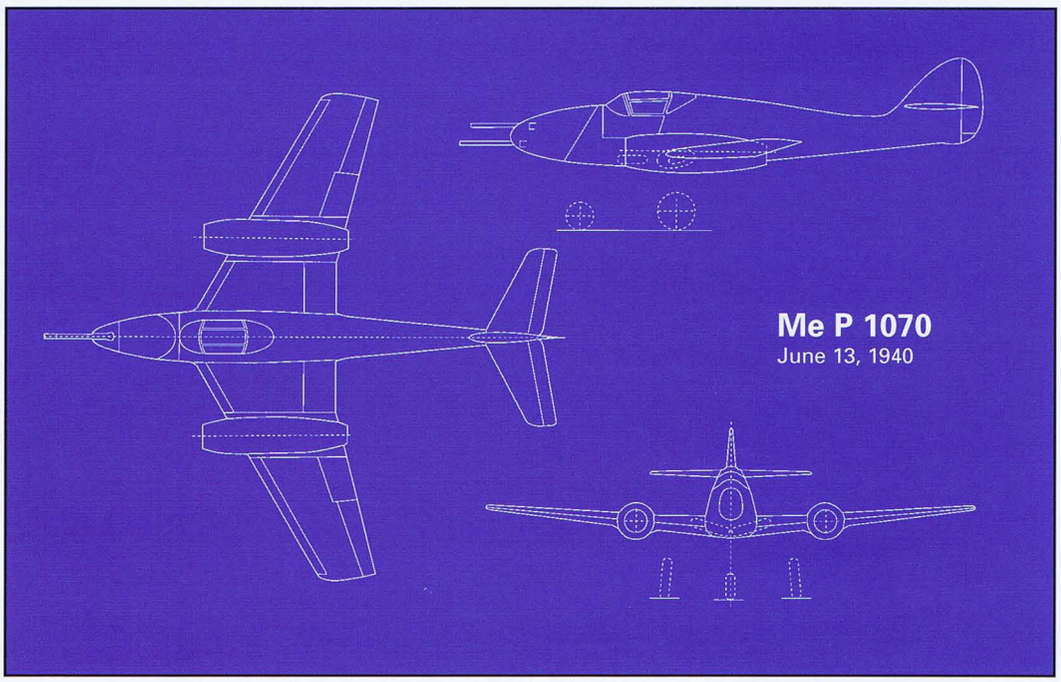


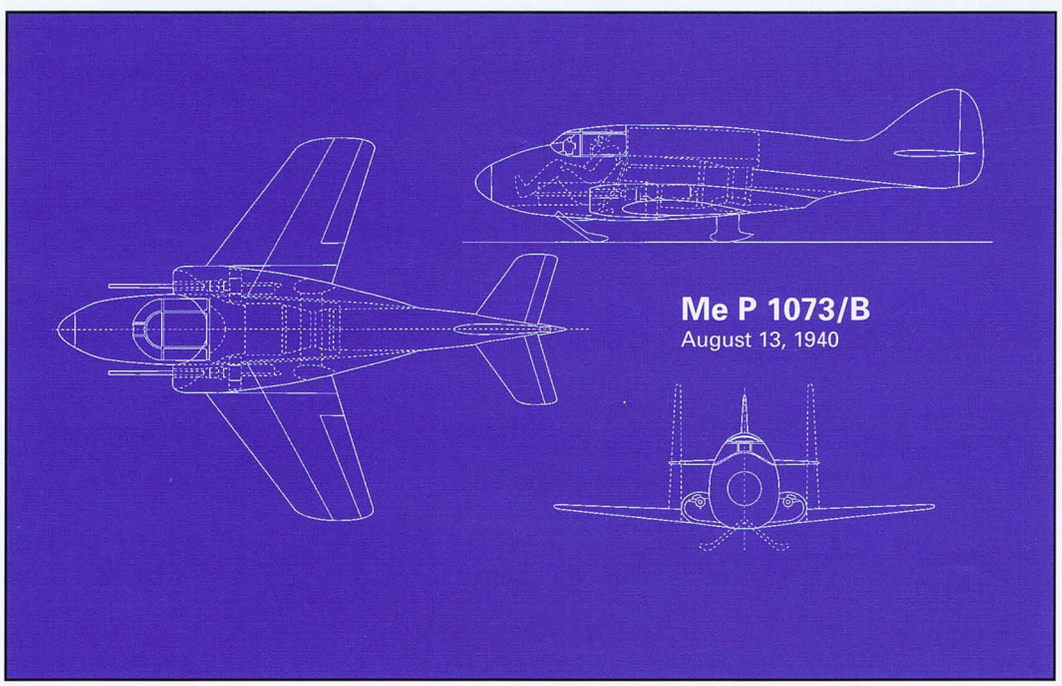
Flying Weight:	**8267 lb.**	**Fluggewicht:**	**3750 kg.**
Wing Area:	**197 sq.ft.**	**Flügelfläche:**	**18.3 m^2**
Armament:	**2 x MG151, 2 x MG17**	**Bewaffnung:**	**2 MG151, 2 MG17**
Armor:	**205 lb.**	**Panzerung:**	**93 kg.**
Endurance:	**1.2 hrs.**	**Flugdauer:**	**1.2 h.**
Fuel:	**370 gal.**	**Kraftstoffmenge:**	**1400 l.**
Fuel Consumption:	**309 gal./hr.**	**Kraftstoffverbrauch:**	**1170 l/h**



Left: A perspective representation of the Messerschmitt P 1065 as of July, 1940. In this arrangement the two BMW P 3302 turbojets were mounted above the wings as an alternative to the midwing installation originally considered. This plan was soon amended to relocate the two turbojets to a point beneath the wings. This layout was finalized and plans were made to begin construction of the Me P 1065 V1 during September 1939. By February 1941, the project number, P 1065, was supplanted by the official RLM designation Me 262.

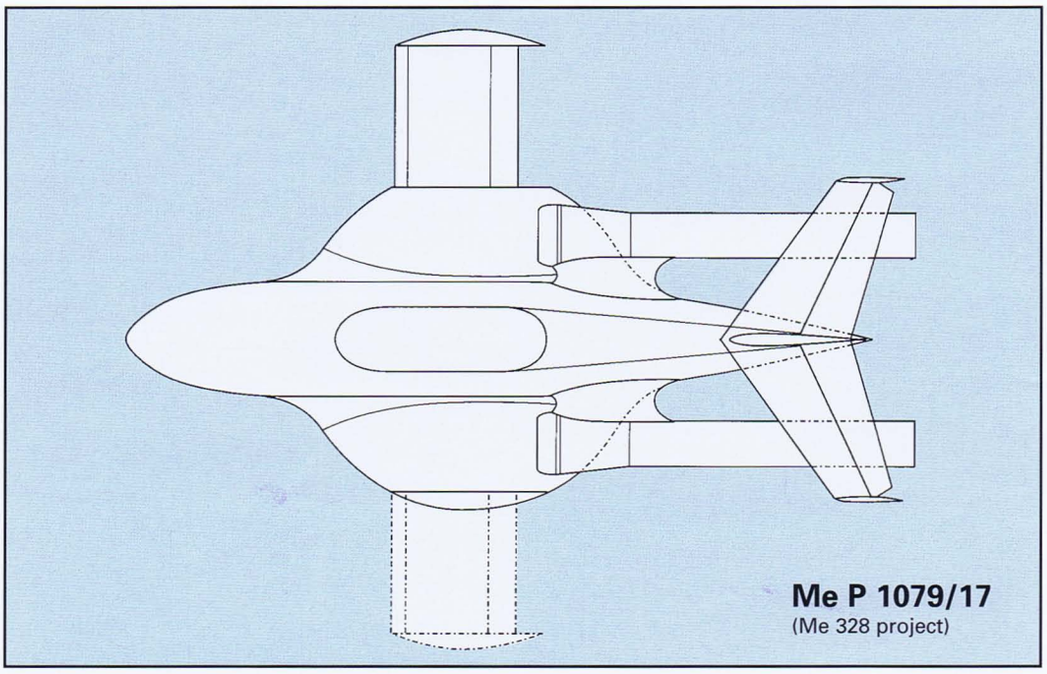
Right: The Messerschmitt P 1070 of 1940 shows a design roughly similar to the firm's P 1065, but with sweptback wings and armed with two cannon. Wingspan was 26.9 ft (8,20 m), length was 26.3 ft (8,00 m), and the height was 9.5 ft (2,90 m). Wing area was recorded at 139 ft^2 (13 m^2) with an anticipated gross weight of 6,173 lb (2,800 kg).

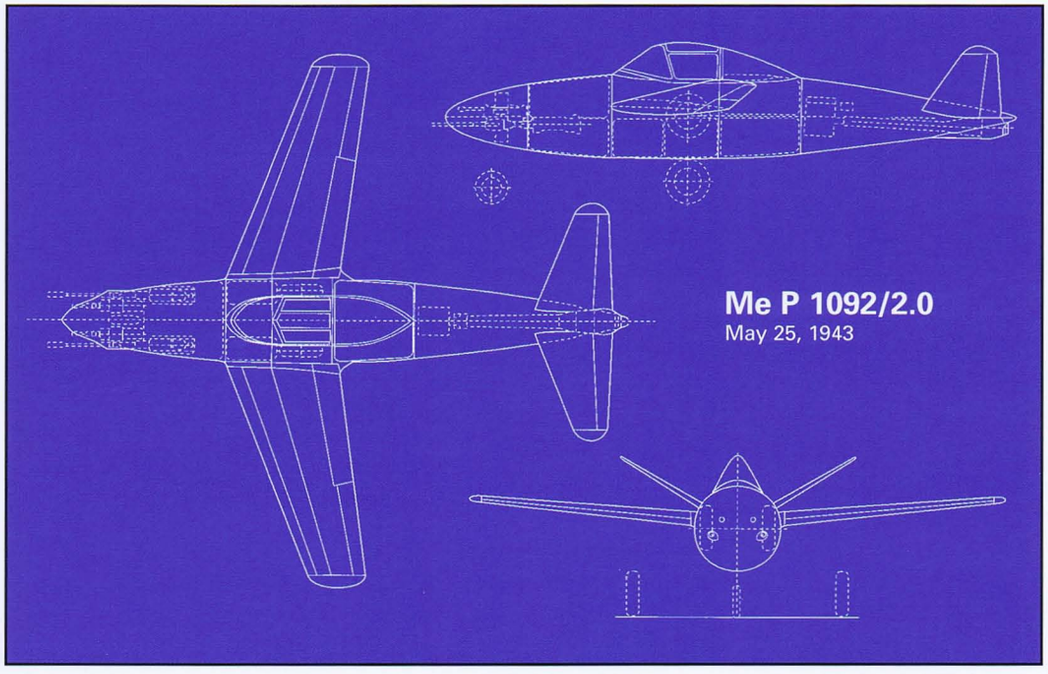




Left: The small parasite fighter, Messerschmitt P 1073B from August 13, 1940, designed to fit within the cavernous fuselage of the eight-engined long-range reconnaissance Me P 1073A. The aircraft's mission would have been to protect the piston-engined parent aircraft. Unlike American postwar parasite fighters (see p. 149), there was no provision for in-flight recovery. The P 1073B's skis were to facilitate water landing. One BMW P 3304 (BMW 002) was to be installed within the fuselage and armament was to be two MK 103 or 108 cannon. Wingspan: 14.4 ft (4,4 m), Length: 19.4 ft (5,9 m), Height: 5.9 ft (1,8 m).

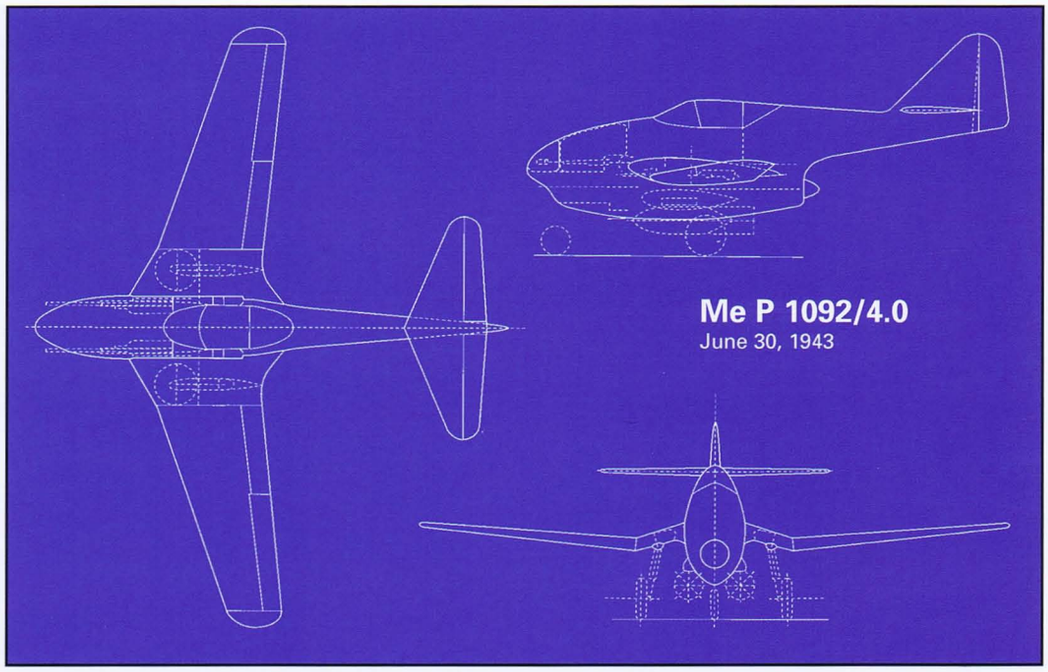
Right: The unusual Me P 1079/17 was another attempt to develop a small single-seat parasite fighter powered by two pulsejets. Designed in 1940, the aircraft featured a novel telescoping wing which, when retracted, would allow the fighter to be carried within the fuselage of a large parent aircraft. Upon release, the wings would extend and the twin pulsejets started. This project eventually led to the Me 328, albeit to fulfill an entirely different mission.

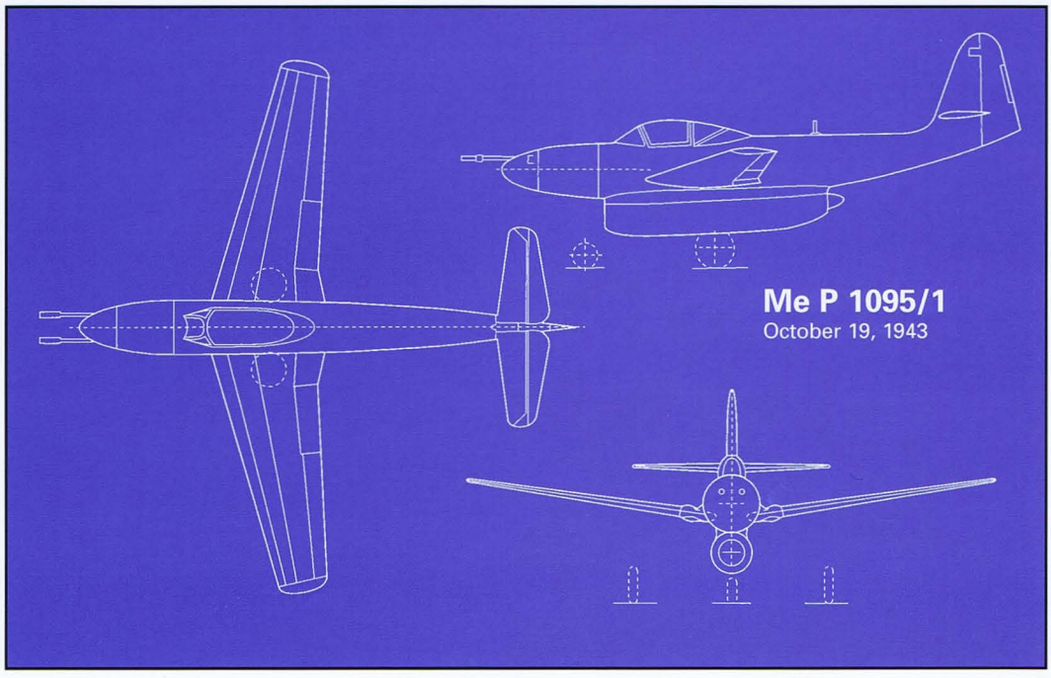




Left: The Me P 1092/2.0 was a heavily armed rocket-powered interceptor project drafted in May 1943. It featured a bullet-shaped fuselage with a so-called butterfly tailplane and armed with two MK 103 and 108 cannon. The aircraft had a wingspan of 27.5 ft (8.70 m), its length was 29.5 ft (9.00 m), and its height was 8.2 ft (2.50 m). Six fuel tanks occupied most of the fuselage ahead of the rocket motor.

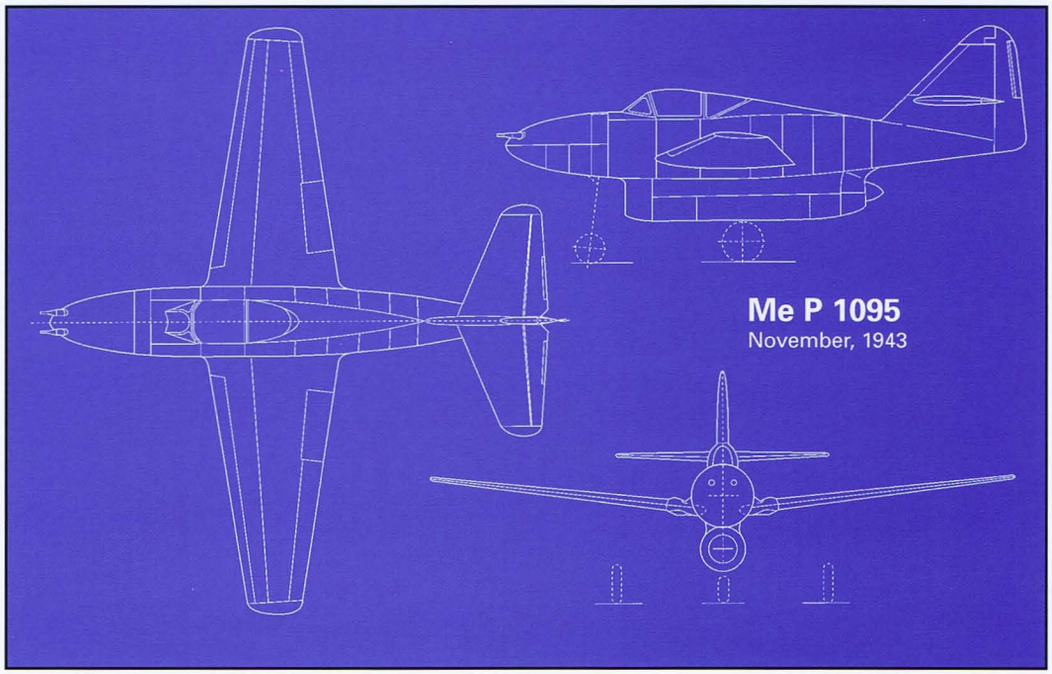
Right: The Me P 1092/4.0 of June 1943, featured an entirely different design based on the Lippisch P 20. This proposal incorporated an Me 262 tailplane fitted to the short stubby fuselage and armed with two MK 103 cannon. Provision was also made for carrying up to two bombs attached to special fuselage-mounted carriers. Power would have been provided by a single turbojet located beneath the cockpit.

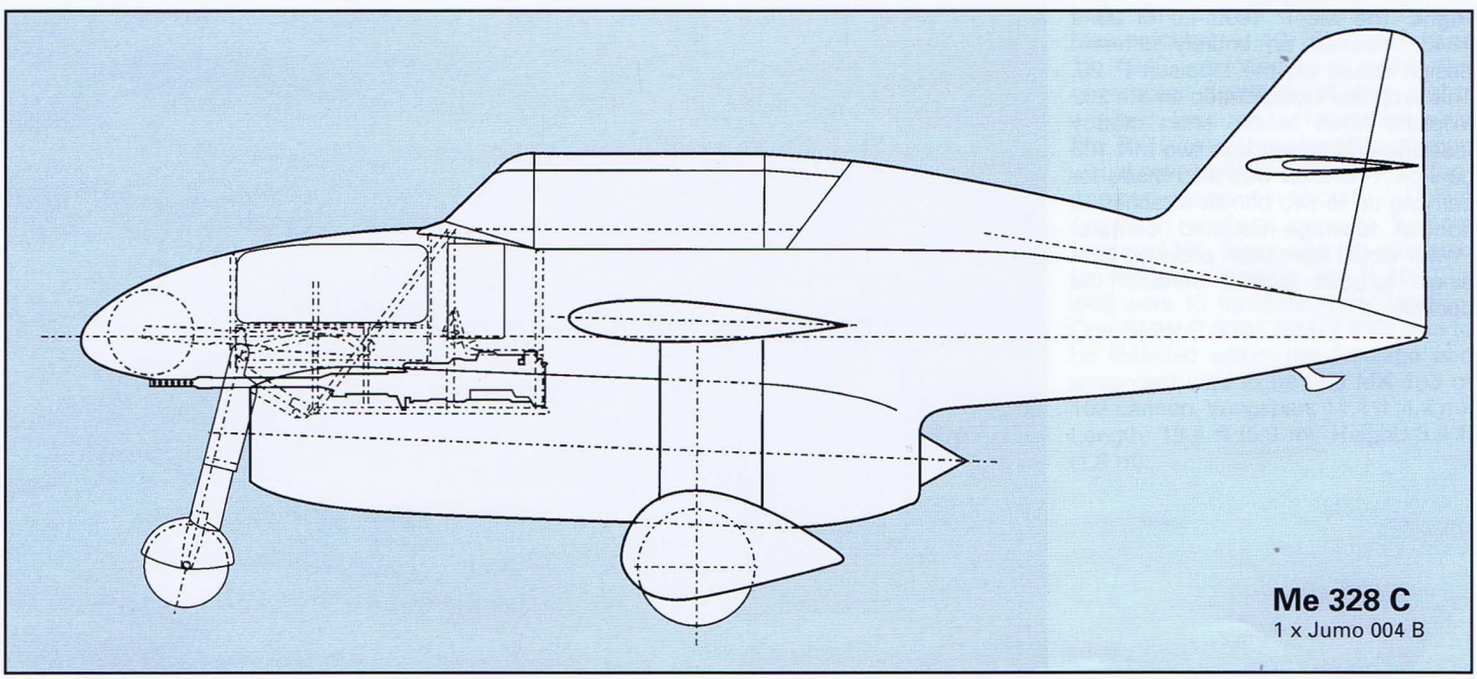




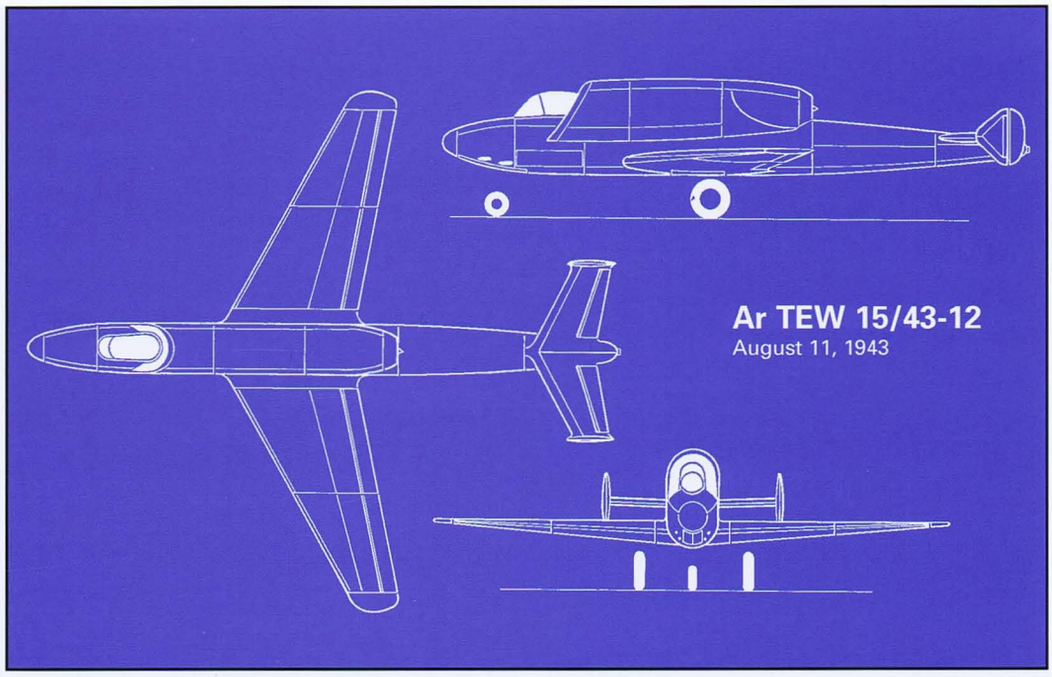
Left: The Me P 1095/1 of October 1943, was a jet fighter design incorporating wings, control surfaces and cockpit from the Me 262, while the tailplane and undercarriage were from the Me 209. A single Jumo 004 turbojet was centrally under the fuselage and two MK 103 cannon were to be installed with their long barrels extending well beyond the nose.

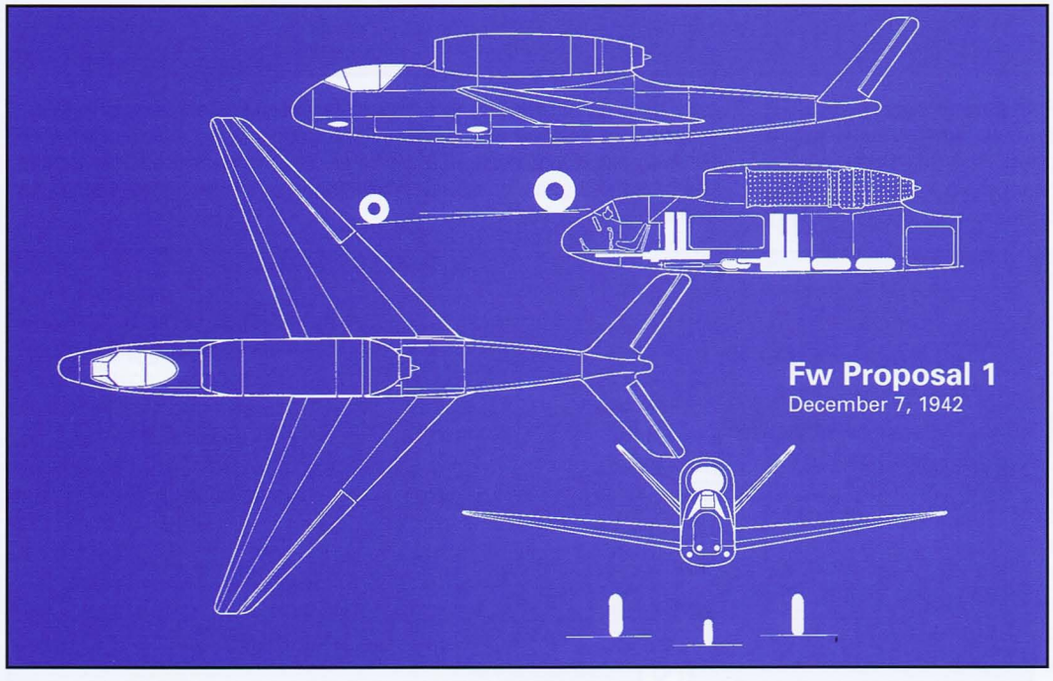
Right: The Me P 1095/2 was similar to the earlier version but switched the Me 209 tailplane for that of the Me 262. At the same time, the wings were changed to use a design similar to that intended for the Me 155. Armament was to consist of one MK 108 plus one MG 151 cannon in the nose. Below: The Me 328 C. This project, derived from the P 1095, was never completed. It would have had a retractable nosewheel, but the main gear would have been non-retractable and enclosed in streamlined fairings.





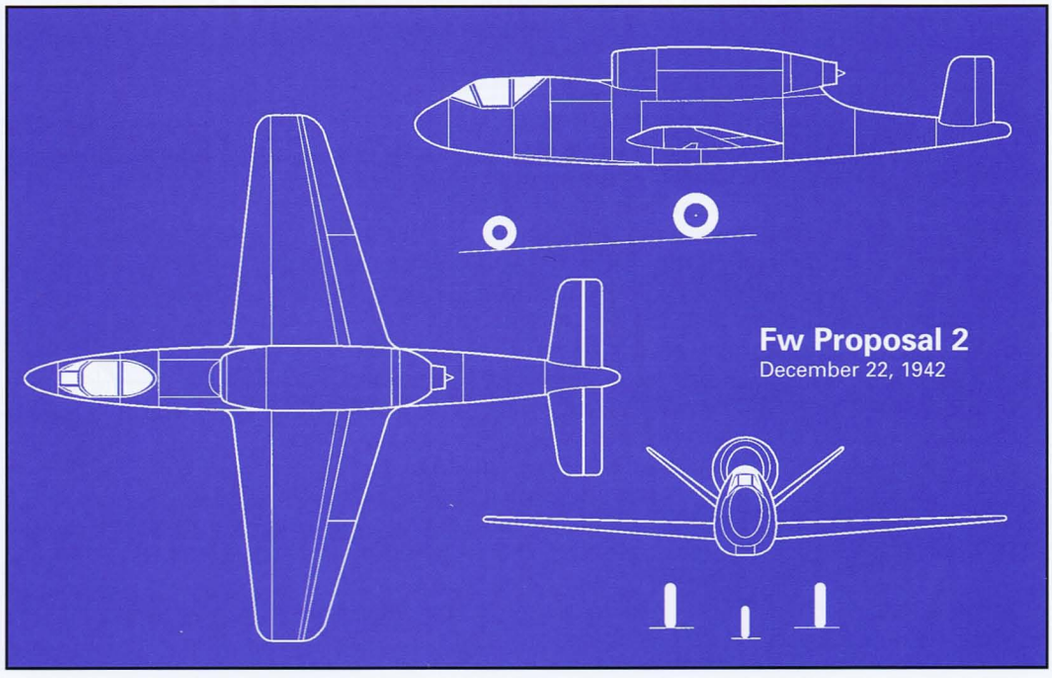
Right: The Arado Ar TEW 15/43-12 of August 11, 1943, was a single-seat fighter design to be powered by a single Jumo T1 turbojet (later the Jumo 004). The twin fin and rudder tailplane would have been far too small to have been successful.

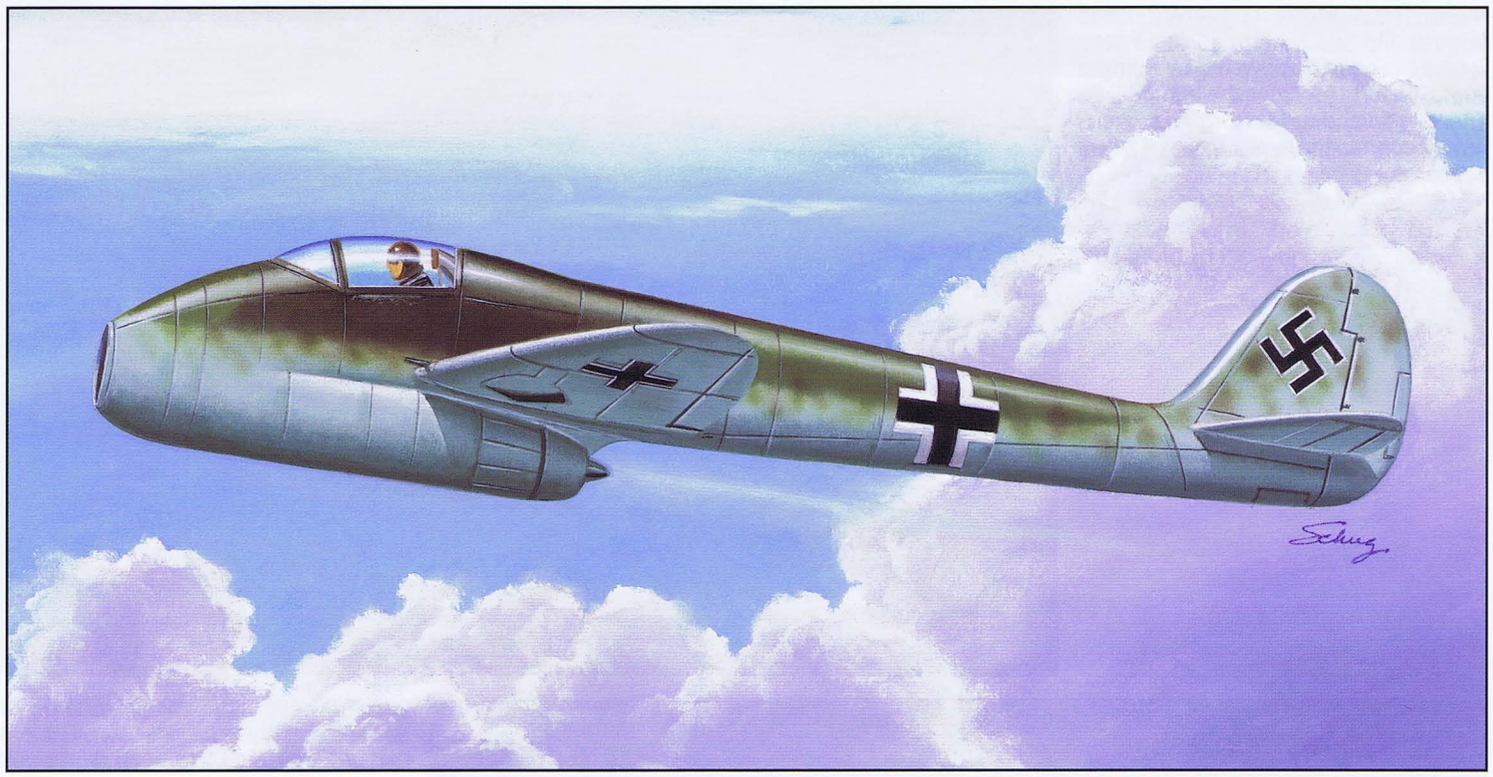




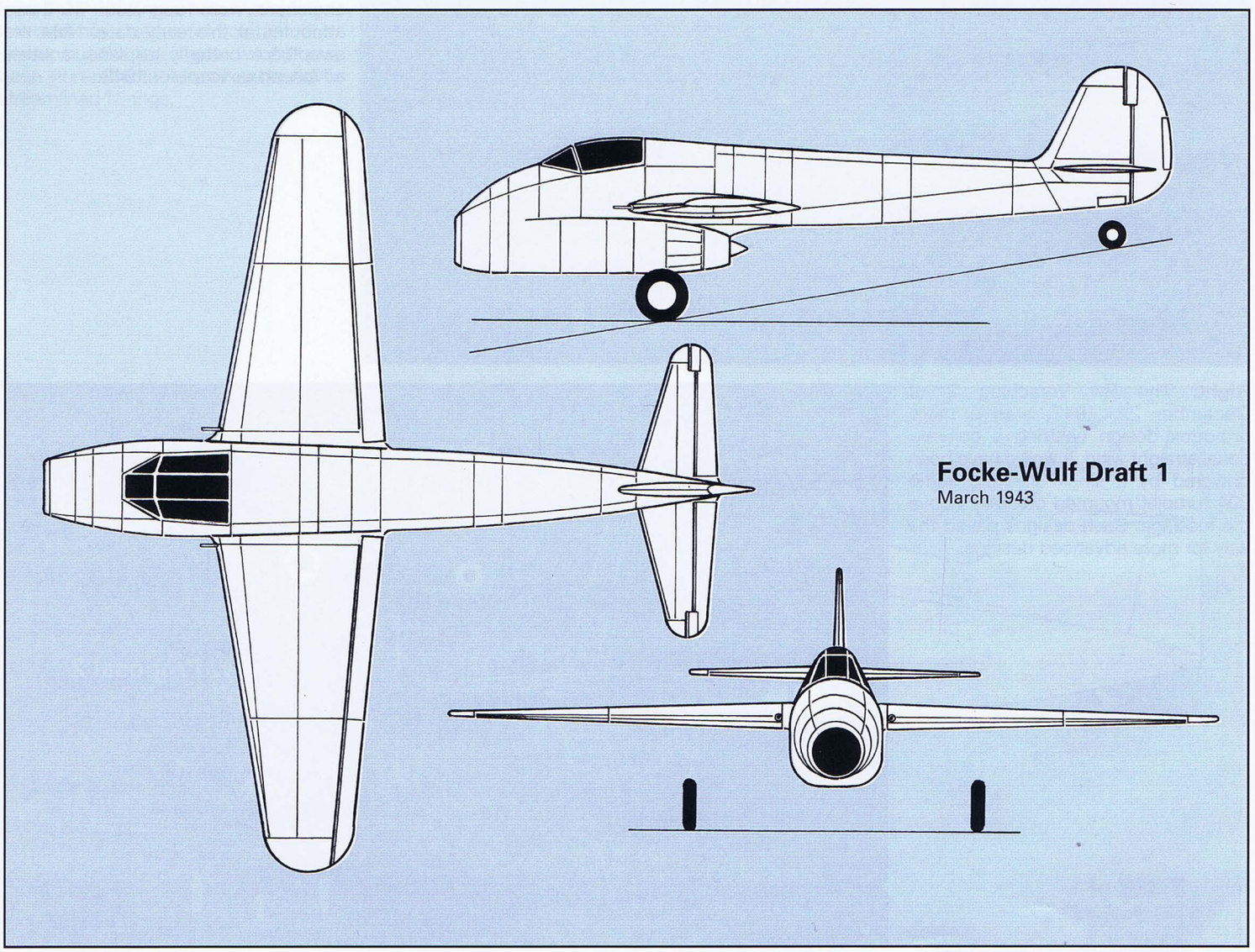
Left: The Focke-Wulf company devised radical design known as the Fw Vorschlag 1 (Proposal 1) on December 7, 1942. This is probably one of the earliest examples of forward swept wings. The usual reason given for using this form of wing design is to improve low-speed handling qualities, but it is uncertain if the Focke-Wulf engineers were cognizant of these attributes at this early date. Note the sweptback butterfly tailplane...another advanced concept for 1942.

Right: The Fw Vorschlag 2 of December 22, 1942, was a more orthodox design unitizing a conventional straight wing. It would have been powered by a single Junkers Jumo 004 turbojet mounted centrally above the fuselage. Such designs paved the way for more advanced designs.





Above and below: The Focke-Wulf P I (Plan I), or Entwurf 1 (Draft 1) of March 1943, the first of several single-seat fighter projects that were seriously considered for manufacture. It had many typical Focke-Wulf features including the curvilinear tailplane, angular windscreen and conventional tricycle undercarriage. German Air Ministry concerns for fire safety in conjunction with the downward angle of exhaust, prevented the project from progressing. Interestingly, the Russians took a different attitude when Yakovlev adopted and adapted the basic design to create his Yak-15 of 1946, the first jet completed in the Soviet Union.



Above: Powered by a Russian copy of the Jumo 004 known as the RD-10, the Yak-17 was a logical development of the Yak-15 incorporating a tricycle undercarriage. Apart from the location of the cockpit, the basic design closely resembled the German Focke-Wulf P I.

cockpit section moved forward. A short time later, Dipl.-Ing. Hans Hornung joined the Me 262 development team, while Dipl.-Ing. Prager, Dipl.-Ing. Mende and Gruppenleiter (team leader) Dipl.-Ing. Seitz were designing a new fighter, the P 1079 (which later became the Me 328 A). When the initial studies were completed in Augsburg, work was transferred to Darmstadt in close cooperation with the Deutsche Forschungsanstalt für Segelflug - DFS (German Research Institute for Soaring) and the Jacobs-Schweyer Company. In October 1943, the RLM decided to terminate further development of the Me P 1079 fighter, now demanding a Tiefangriffsbomber (low-level attack bomber). Even though construction of the P 1079 was well advanced in 1943, the design group gave preference to the P 1095.

The first of these single-seat fighters possessed the tail section of the Me 262 A-1, the modified fuselage of the abandoned P 1079, and wooden wings. The next design had metal wings of shorter span and the rear fuselage of the Me 328. The Jumo 004 was installed underneath the fuselage and differed very little from a similar design used by Focke-Wulf in 1942-43.

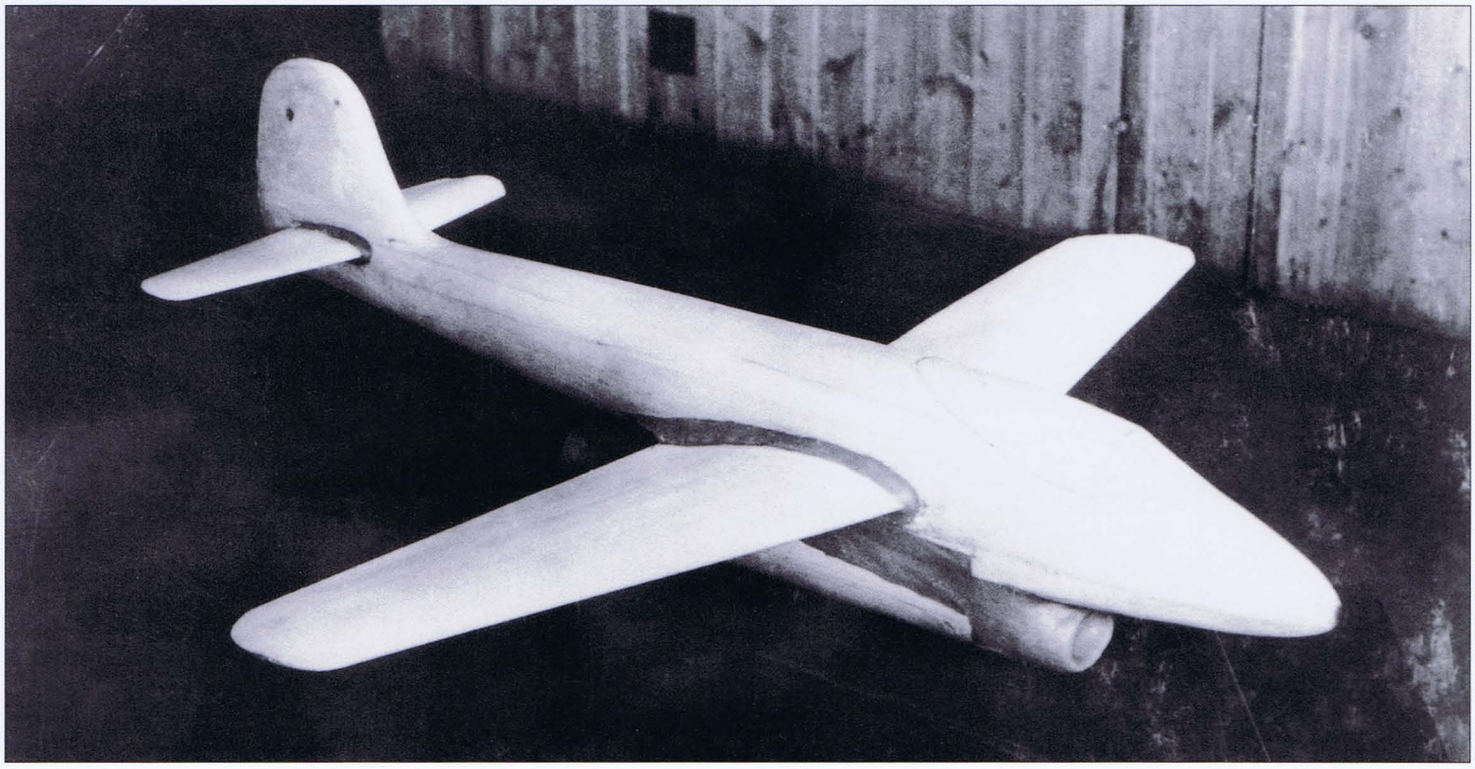
Initially, two different jet-propelled fighters were developed: Vorschlag 1 (Proposal 1), a Fw Jäger mit Turbinentriebwerk BMW P 3302 (Fw fighter with BMW turbo-engine P 3302), and Vorschlag 2 (Proposal 2), a Jäger mit Turbinentriebwerk Jumo 004 (Fighter with Jumo turbo-engine 004). Developed during the later part of 1942, these designs were among the first projects (some featuring swept-forward wings) and were possibly Focke-Wulf's first jet fighter designs.

Three different versions with an average takeoff weight of about 7,275 lb. (3,300 kg) were designed, the first variant featuring swept-forward wings, and either Jumo 004 (the former T1) or BMW P 3302 turbojet units. The third model dispensed with sweptback wings and was powered by a BMW 003A1 turbojet. The single jet engine was mounted on top of the fuselage, forward of the center section. The wing was swept-forward 30 degrees, and the tail surfaces had a dihedral of 45 degrees, and were sweptback. There was no true vertical fin or rudder. Fuel was carried in two fuselage tanks, and a tricycle undercarriage was to be installed. The armament consisted of two MG 151s (300 rounds per gun) and two MK 108s with 200 rounds each, firing forward.

Beginning in March 1943, and extending through August 1944, Prof. Kurt Tank and his Focke-Wulf staff developed a completely new series of design studies for single-seat, single-engine jet day fighters, under the internal company umbrella designation Entwurf (Draft) 1 through 7. The first of these, Entwurf 1, featured a conventional aircraft design with a Jumo 004 slung beneath its forward fuselage and an orthodox tricycle undercarriage. Given the company sub-designation P 1 (Plan 1), the design seemed promising enough to the RLM however, it ultimately failed to find favor with the Air Ministry owing to concerns about the downward exhaust blast in relation to the ground and the possibility of fire.

Design of the Fw-TL-Jagdflugzeug (turbojet fighter) Entwurf 2 (P II) was initiated in early May 1943, and finished in June. In order to avoid the shortcomings of its predecessor, a tricycle undercarriage was incorporated in order to obtain better ground clearance. However, in the event of an emergency landing, the underslung turbojet could pose a significant risk. The single-seat fighter was to be equipped with a Jumo 004B and had an estimated takeoff weight of approximately 7,385 lb. (3,350 kg). The installation of a Jumo 004C turbojet was proposed. Two fixed forward-firing MK 108s were to be fitted, one on each side of the pilot's seat. In addition, two MG 151/20s were housed in the wing roots. Radio equipment was to consisted of the FuG 16ZY and FuG 25a units.

In November 1943, a different engineering solution was sought by placing the jet unit above instead of below the main fuselage. It was mounted behind the cockpit, the intakes protruding on each side of the nose. In order to prevent interference with the jet exhaust, twin fins and



rudders were used. This design study, Entwurf 3, was also the P III, or Fw-Jagdflugzeug mit TL-Triebwerk which possessed more advantages than its predecessor. Because of the turbojet installation in the main fuselage, it became necessary to position the two air intakes, one on each side of the cabin in front of the wing leading edge.

Later, in December 1943, a twin-boom interceptor fighter designated Entwurf 4, or Plan IV, was designed. The Fw-TL-Jäger P IV mit HeS 011R Antrieb (Fw-TL-Fighter P IV with HeS 011R propulsion) was the first step toward development of the Flitzer. It was originally referred to as Jagdflugzeug mit Turbinen-Antrieb (fighter with turbojet propulsion). It was proposed to install two additional rocket 2units in order to improve the rate of climb.

In January 1944, Entwurf 5, contained within design description Nr. 279, was advanced by Focke-Wulf engineers. This fifth design draft contained plans for two versions of a new fighter. The first, Plan V (P V), was to be powered by a HeS 011A and be equipped for high altitude operations at 46,000 ft (14,000 m). Plans for this aircraft were approved by the RLM which sanctioned further development under the GL/C designation Fw 252[2]. At the same time it also became the new official Entwurf 3, replacing the former Draft 3 concept study, which had already been abandoned. The second variant was a short stubby fighter design with swept wings and powered by a turbojet and rocket motor. The HeS 011A was augmented by a bi-fuel rocket motor to be mounted above and slightly aft of the turbojet. Known as Plan VI (P VI), the new design study appealed to the RLM which sanctioned continued development of this interceptor fighter. This design study then became the official new Entwurf 2 (with the cancellation of the 1943 Plan II concept study). Initially Focke-Wulf applied the RLM GL/C designation Fw 232 to the new fighter, but since this number had already been assigned to Arado for their Ar 232 transport which, was in active service with the Luftwaffe (although in very modest numbers), the Air Ministry reassigned the unused GL/C number 183 to the design, concurrently allowing Kurt Tank to add the first two letters of his surname as a prefix.

2 The RLM GL/C number 252 had previously been assigned to Junkers for their Ju 252, a three-engined transport that failed to enter mass production.

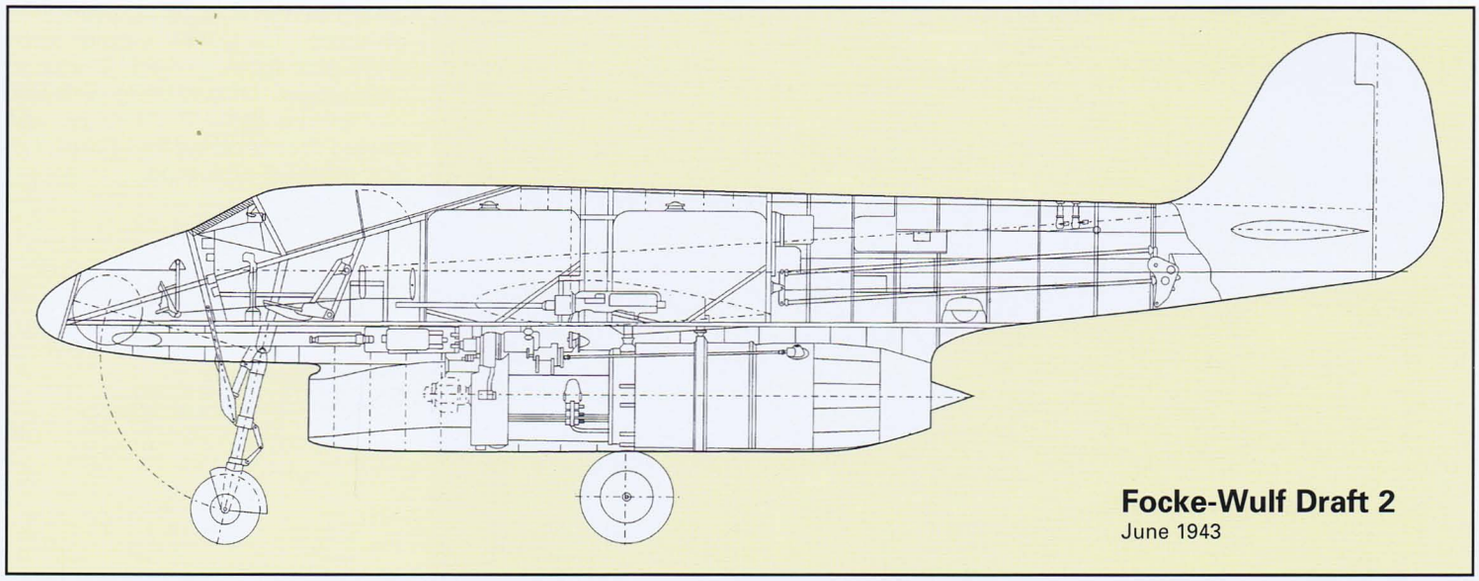
Above: A wind tunnel model of the Fw P II or Entwurf 2 dating from May-June 1943. The P II was of conventional design, but the location of the underslung jet engine did not find favor within the Air Ministry. In the event of a wheels up landing, the airframe and engine would have suffered serious damage. This fact forced cancellation of the project.

Thus, the Ta 183 was the officially recognized identifier however, soon thereafter it became known by the nickname Huckebein, after a cartoon raven who got others into trouble.

Created under the direction of Dipl.-Ing. Hans Multhopp, the new Focke-Wulf fighter design had been expanded to include four possible variations of the theme. The first of these, the Ta 183 Ra-1[3], was equipped with the HeS 011R which was a turbojet fitted with an auxiliary bi-fuel rocket motor. The Ta 183 Ra-2 was similar but switched to the Jumo 004B and had an increased wingspan. The Ta 183 Ra-3 was to revert to the HeS 011 but without the rocket motor. While generally similar, the Ta 183 Ra-4 was to serve as the definitive interceptor fighter powered by the HeS 011A.

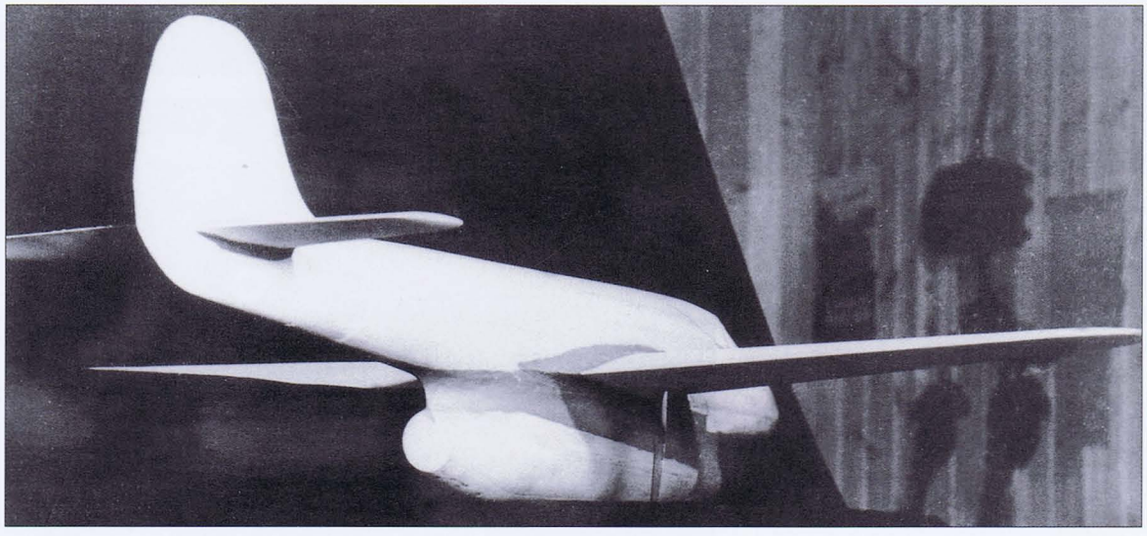
Throughout 1944, Dipl.-Ing. Multhopp and his associates, accomplished much with the Ta 183, but continued production difficulties with the complex HeS 011 retarded development. In spite of the fact that the Jumo 004 was already considered for the Ta 183, this new engine was essentially earmarked for the Me 262 that was then entering production. Nevertheless, on January 10, 1945, a small number of Jumo 004s were made available to Focke-Wulf for the Ta 183 program as set forth in short description Nr. 30. Although a number of production schedules had to be constantly amended, the final schedule called for the first three flying prototypes (Ta 183 V1 - V3) to be patterned after the Ta 183 Ra-2 to Ra-4 with the V1 receiving the Jumo 004B and the others fitted with the long-awaited HeS 011 A-0. In the event the HeS 011 was not available in time, all three prototypes were to use the Jumo 004B as a stopgap until production of the HeS 011 A-1 could begin during the summer of 1945.

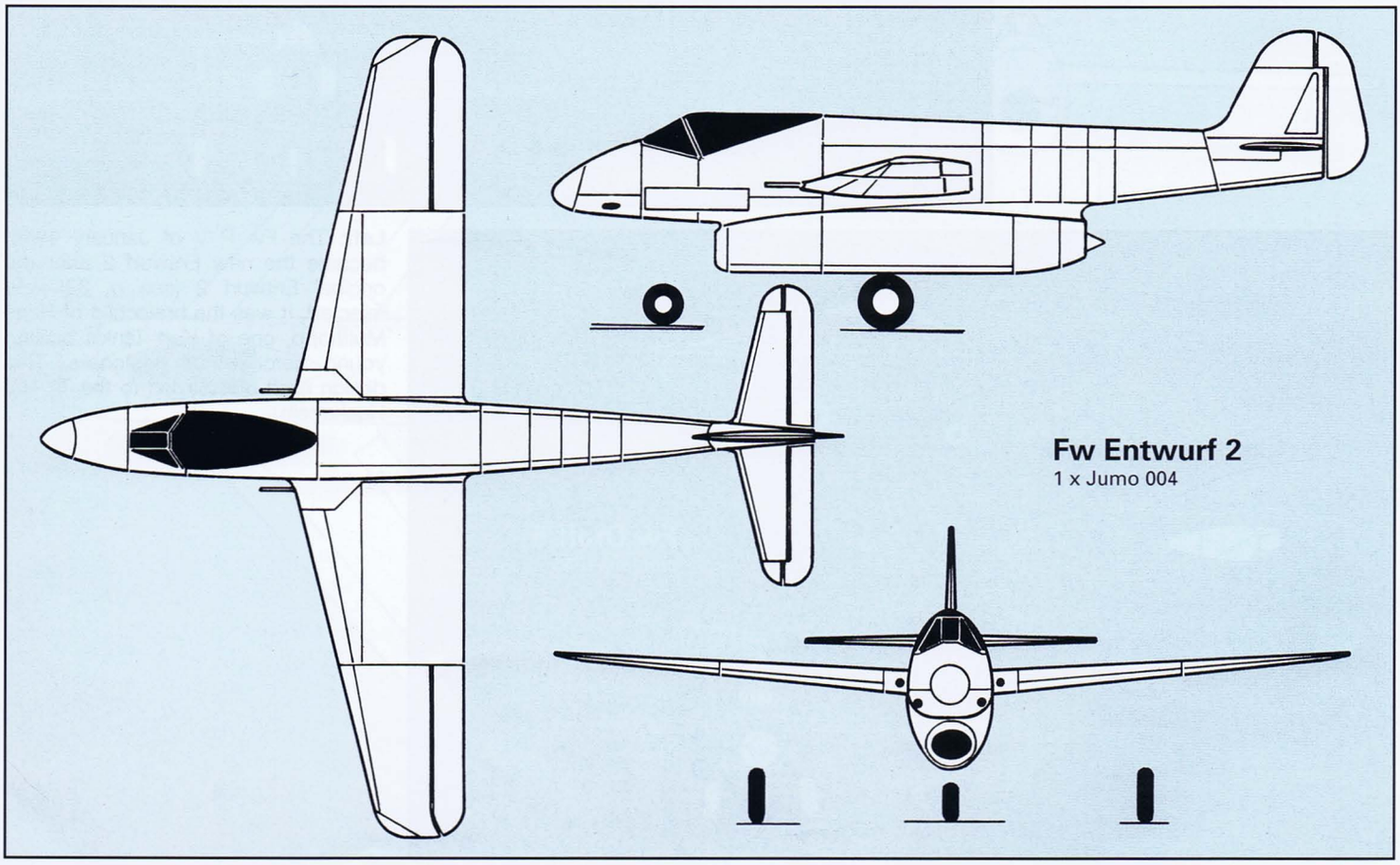
3 Ra - Rechnerische Ankündigung / Analytical prospectus, an internal company designation.



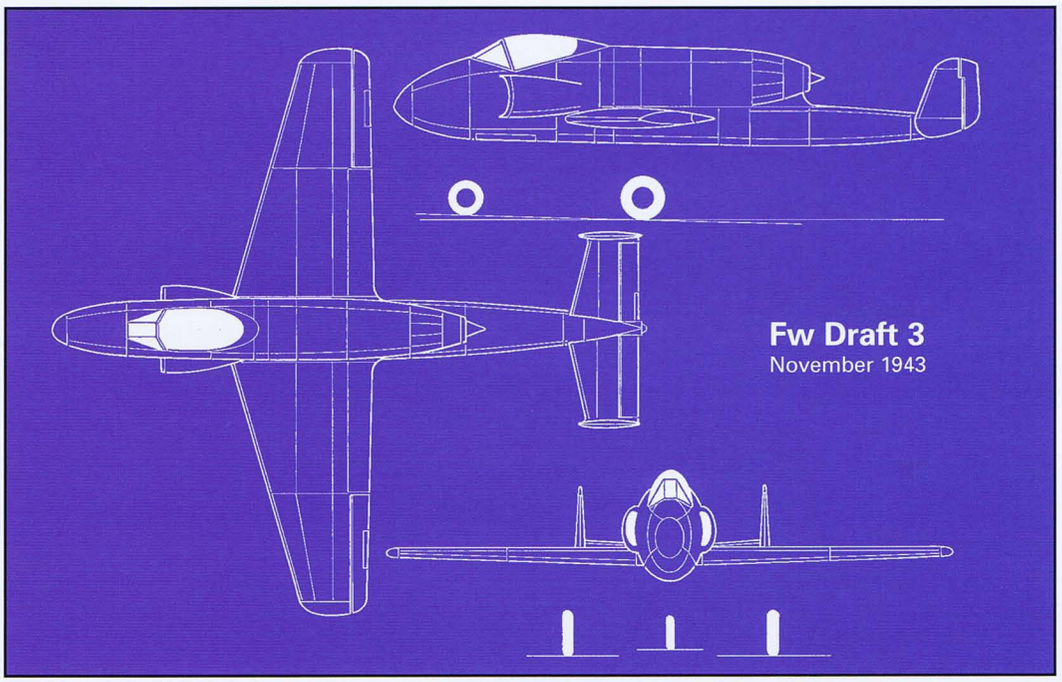
Focke-Wulf Draft 2
June 1943

This page: The Fw P II was a typical Focke-Wulf design based upon proven engineering principles. The only real revolutionary aspect to the design was the turbojet. In spite of the RLM's hesitancy to sanction the design, the aircraft probably would have performed quite well.



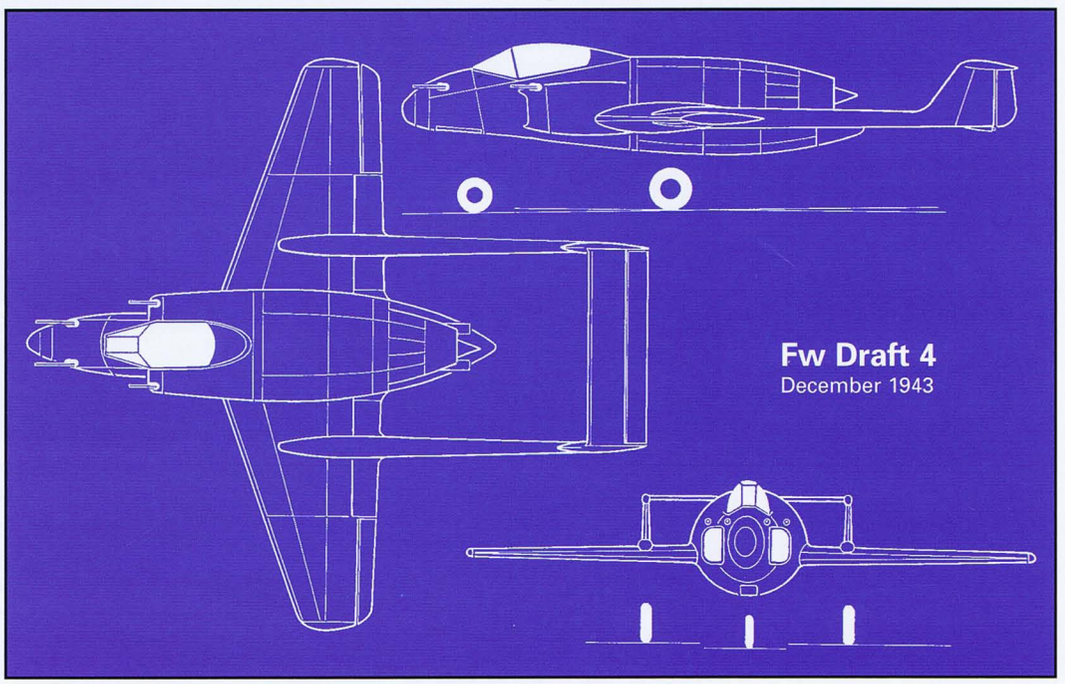


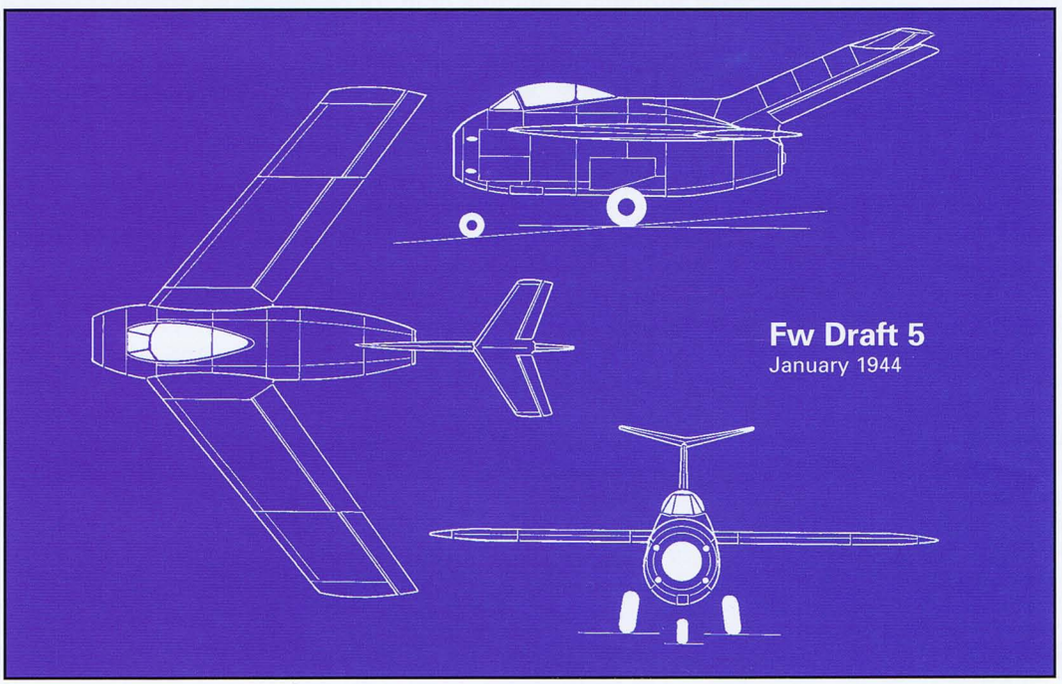
Fw Entwurf 2
1 x Jumo 004



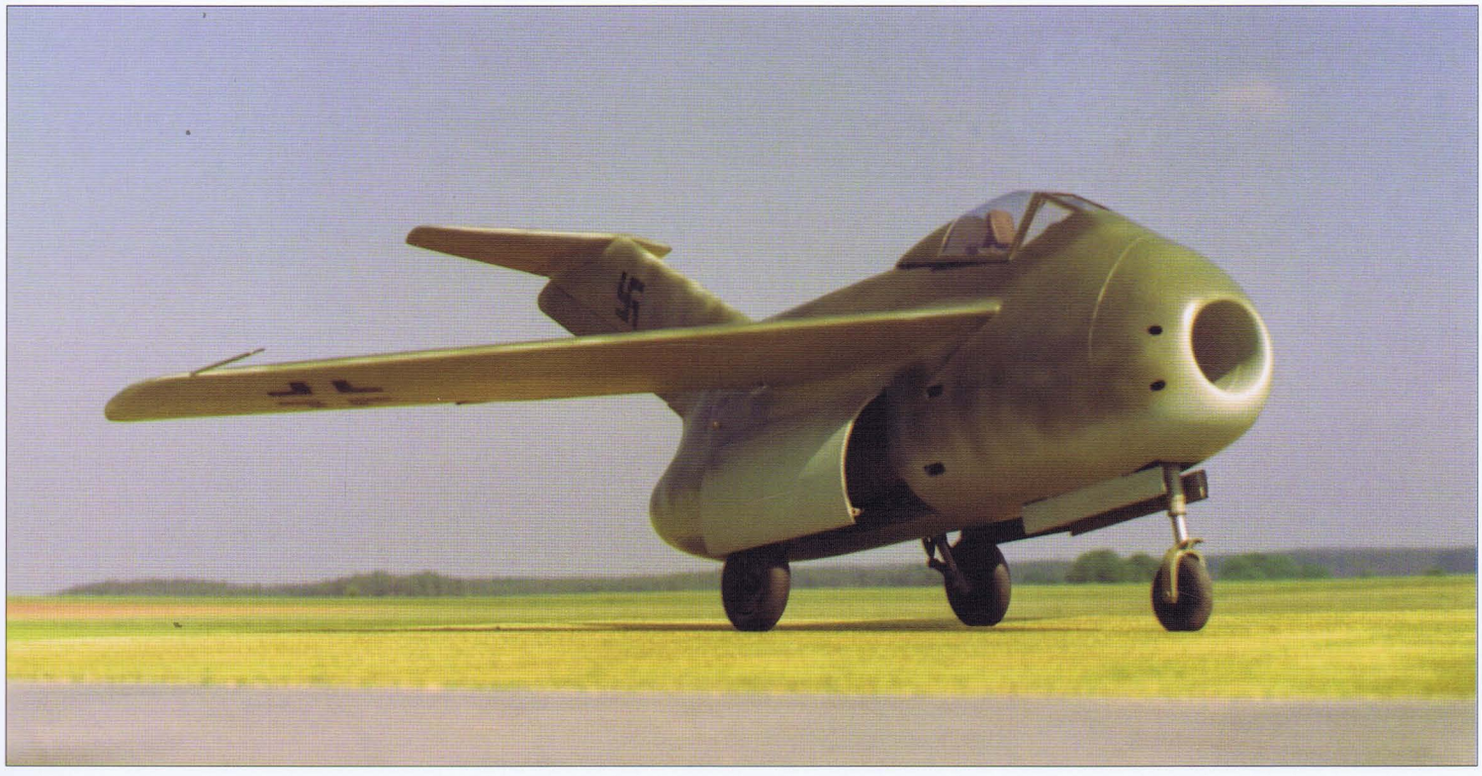
Left: The Fw P III, or Entwurf 3 of November 1943, was another failed single-seat fighter project. It was an awkward conventional design with twin fins and rudders. The turbojet was located directly behind the cockpit with side-mounted air scoops.

Right: The rotund Fw P IV, or Entwurf 4 of December 1943, was to have been powered by a jet augmented by two auxiliary rockets positioned beneath the turbojet. It too was rejected, but the basic concept paved the way for the Focke-Wulf Flitzer of 1944.



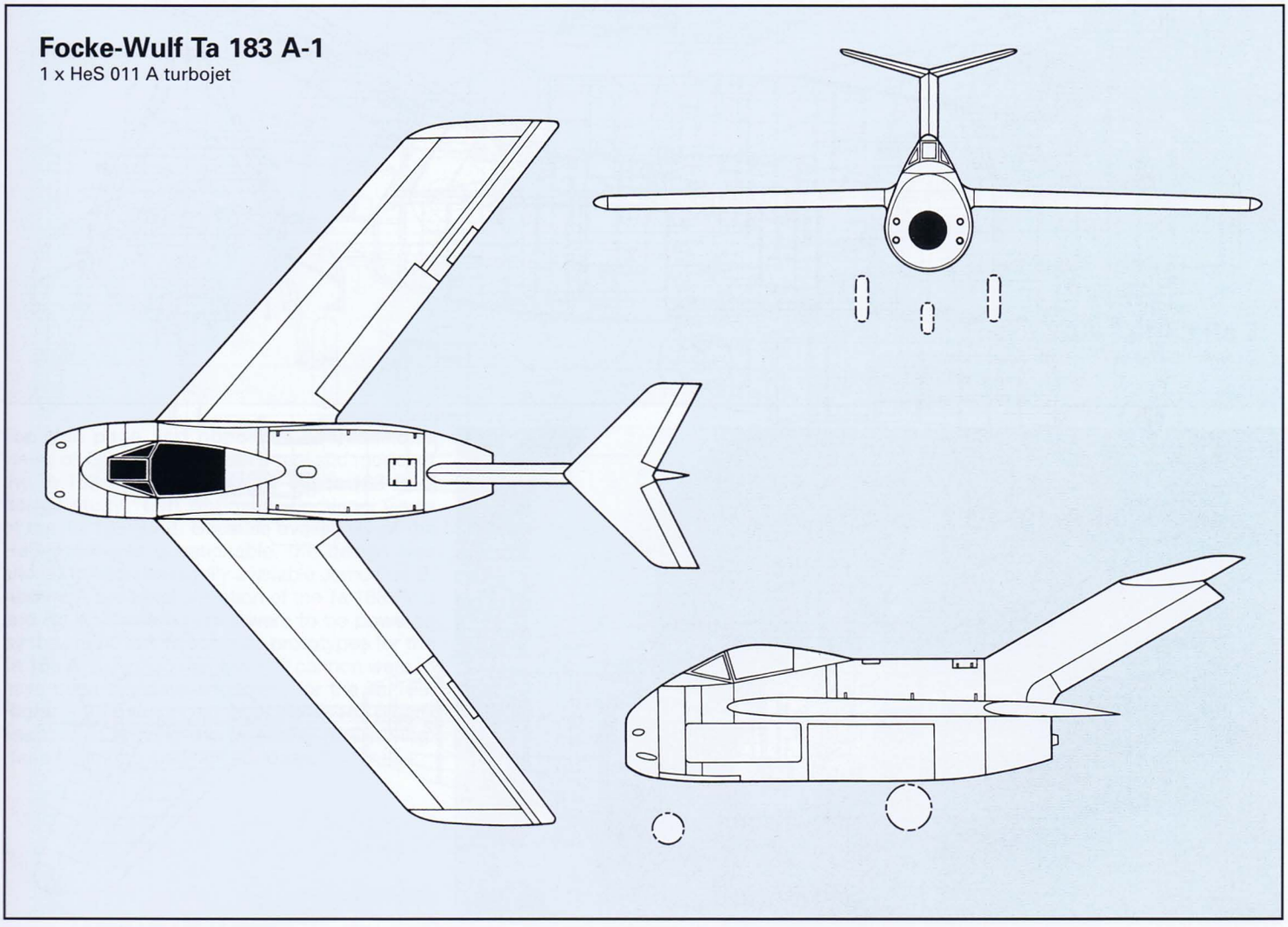


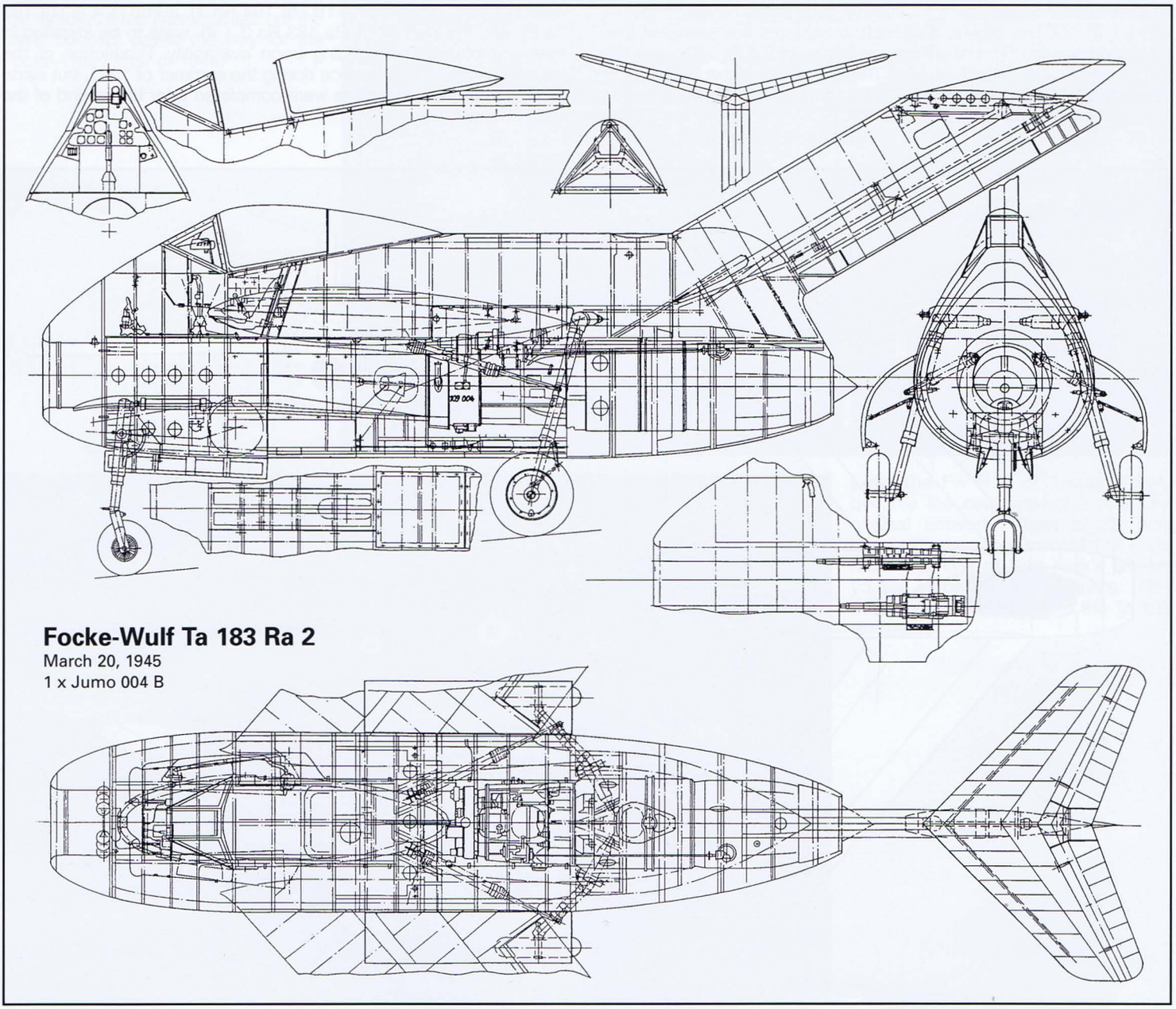
Left: The Fw P V of January 1944, became the new Entwurf 2 after the original Entwurf 2 (see p. 32) was rejected. It was the brainchild of Hans Multhopp, one of Kurt Tank's brilliant young aeronautical designers. This design draft directly led to the Ta 183 Huckebein.



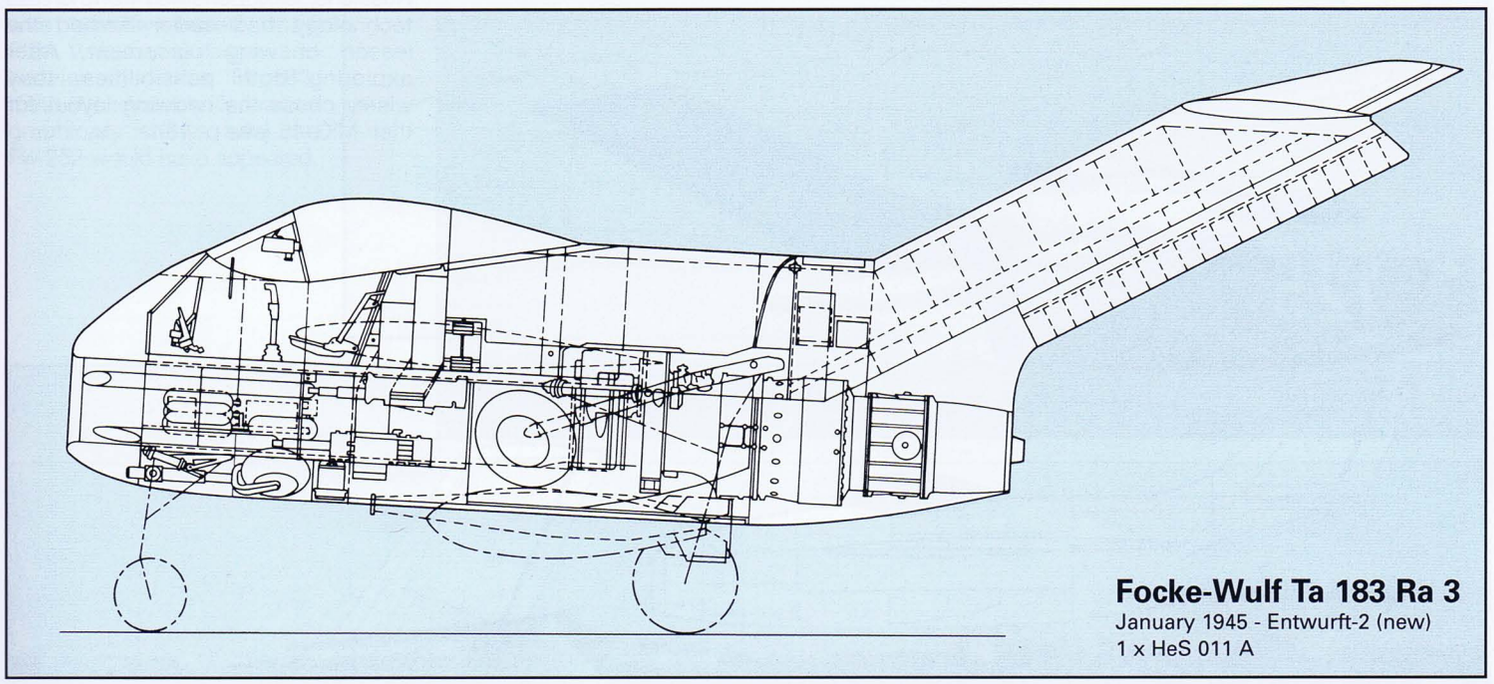
Above: Günter Sengfelder's impressive large-scale model of the Ta 183 V1 (Ra 2), Huckebein, successfully captures the shape of this advanced project. Several different versions of the Ta 183 were set forth in addition to the interceptor. These included a reconnaissance version fitted with a single Rb 20/30 camera, and fighter-bomber variant that could carry a single SC 500, SC 250 bomb, or five SC 50 or SD 70 antipersonnel bombs. In addition, three different engines were planned. The HeS 011R (Ta 183 Ra 1), Jumo 004 B (Ta 183 Ra 2), and the HeS 011A (Ta 183 Ra 3 + 4), were to be installed in various prototypes depending upon availability. Production of the Huckebein was to commence during the summer of 1945, but aside from construction jigs, none were completed prior to the end of the war in Europe.

Focke-Wulf Ta 183 A-1
1 x HeS 011 A turbojet

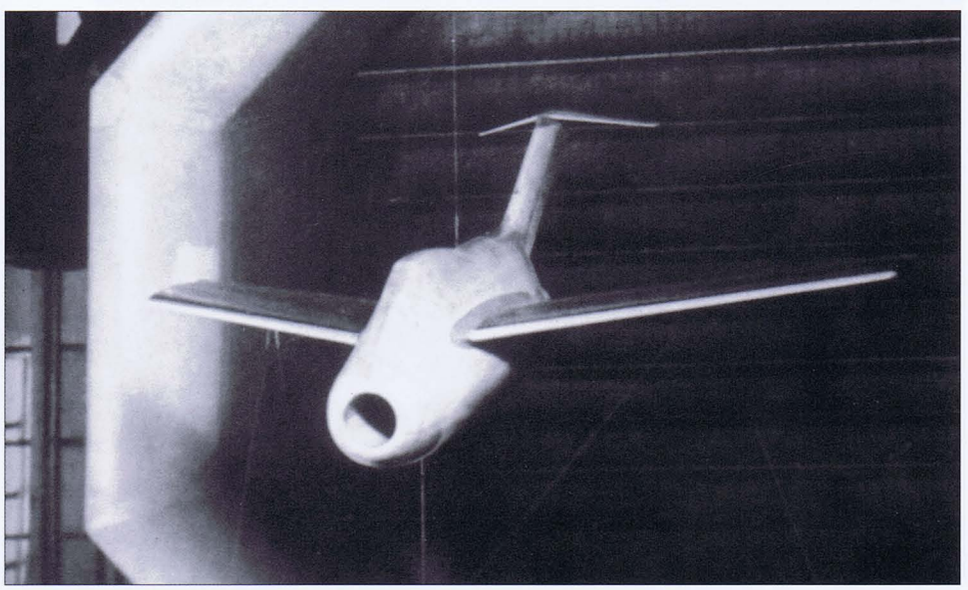


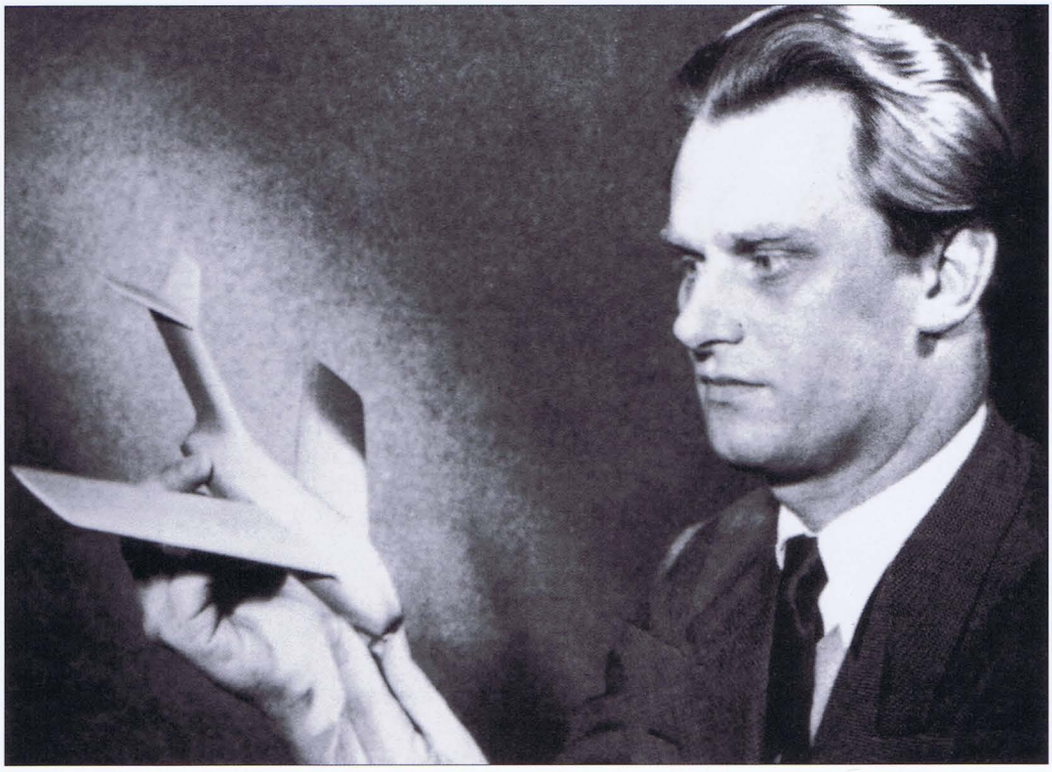


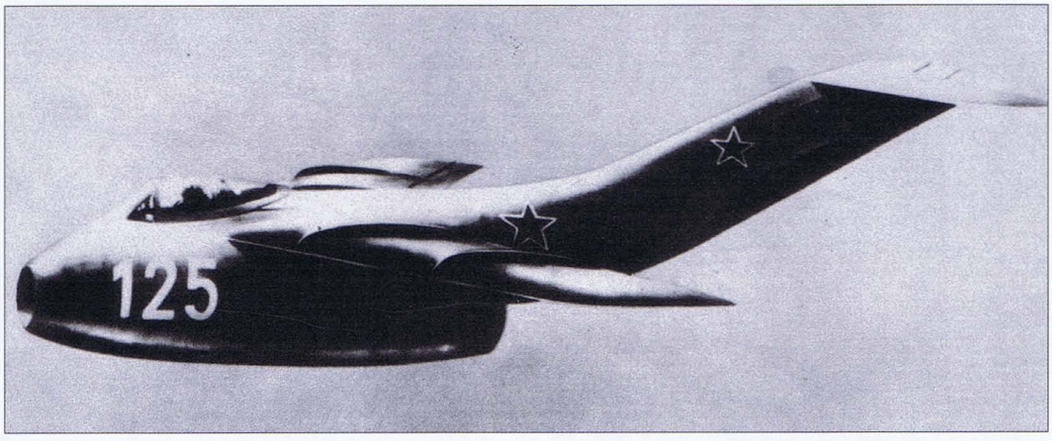
Focke-Wulf Ta 183 Ra 2
March 20, 1945
1 x Jumo 004 B



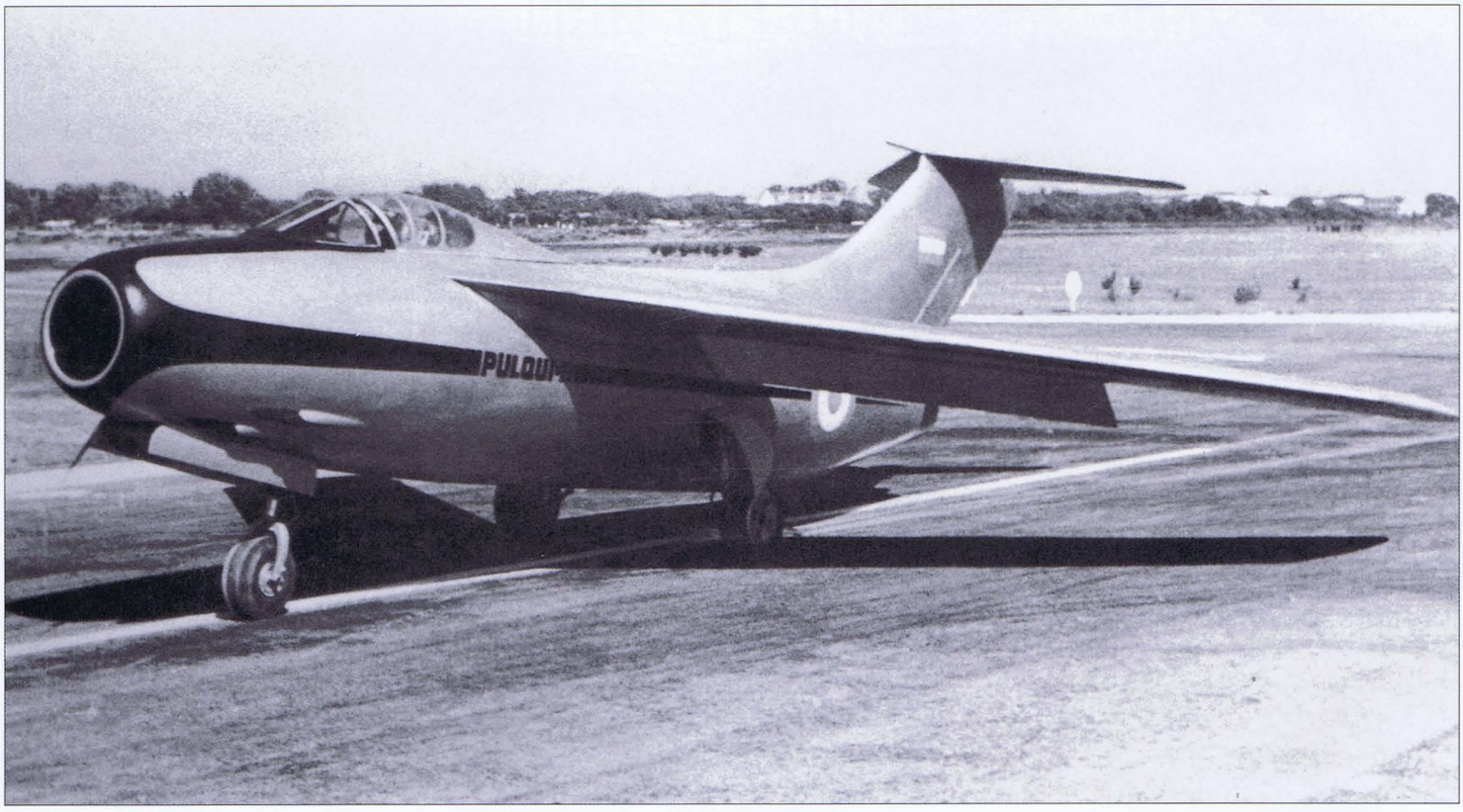
Top this page and opposite: Two additional views of Günter Sengfelder's realistic model of the Ta 183 V1 (patterned after the Ta 183 Ra 2 design study). **Left opposite:** Sectional views of the Ta 183 Ra 2. Because availability of the HeS 011A was questionable, the design was altered to take the readily available Jumo 004 B. **Above:** A sectional elevation of the Ta 183 Ra 3 and Ra 4. These versions were to be powered by the HeS 011A to serve as prototypes for the Ta 183 A-1. Two 30 mm MK 108 cannon were to have been standard armament for the Ta 183. **Right:** A wind tunnel model of the Ta 183 greatly assisted in proving the feasibility of Dipl.-Ing. Hans Multhopp's advanced ideas.

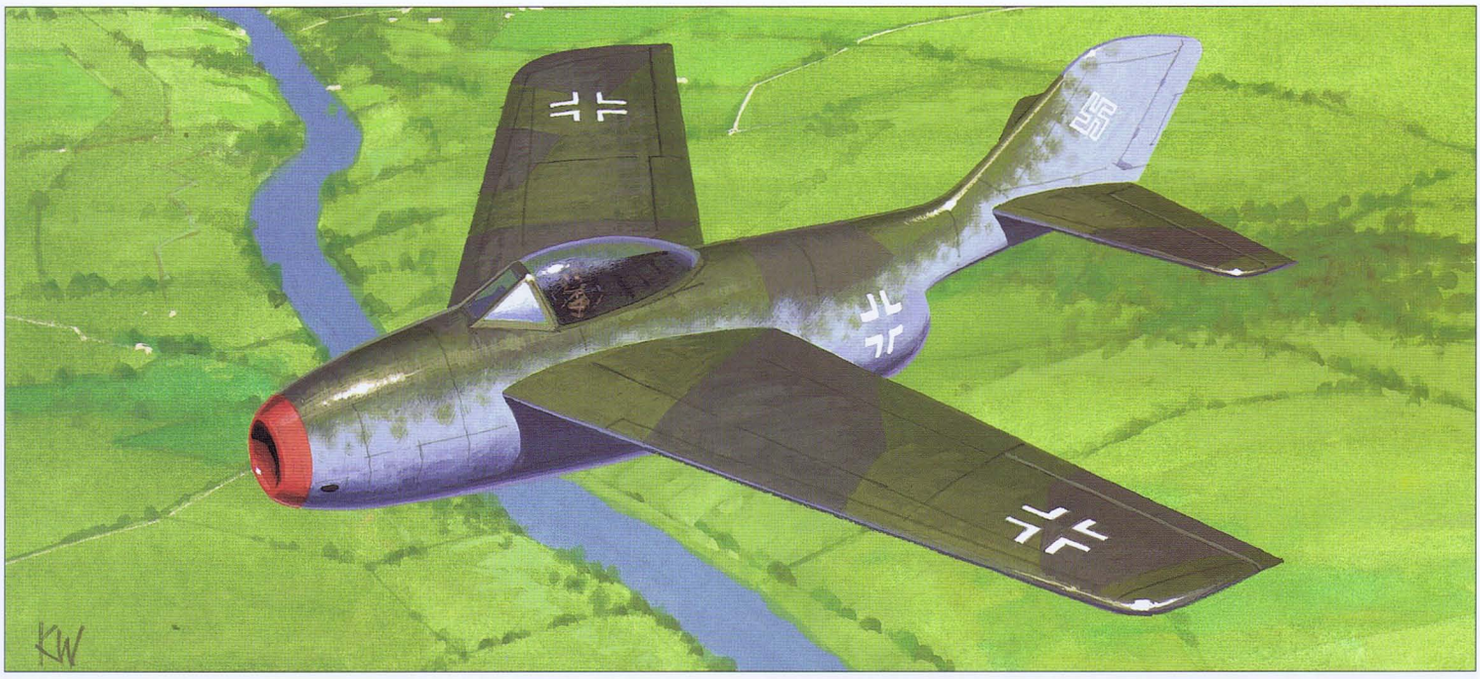




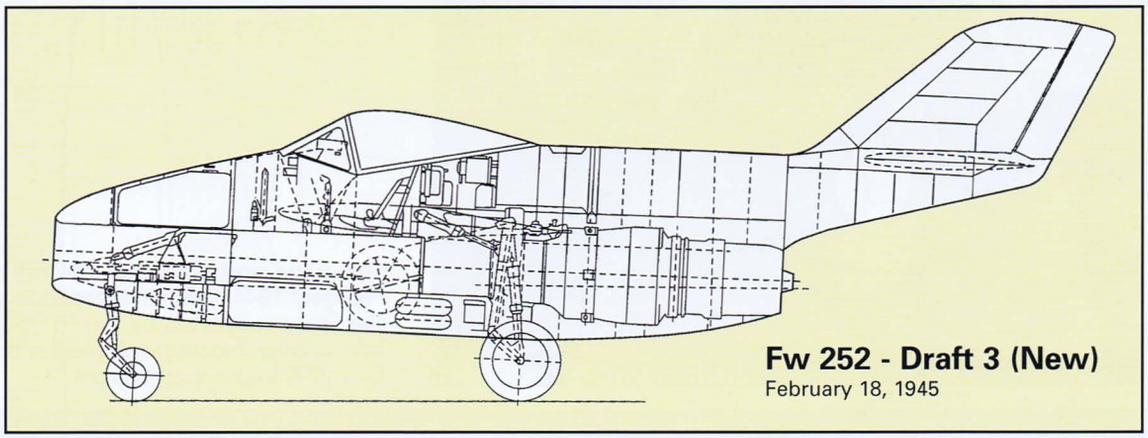


Left: Dipl.-Ing. Hans Multhopp holds a scale model of his Ta 183. Multhopp who, as a young gifted aerodynamicist at Focke-Wulf, was a member of Kurt Tank's advanced design team responsible for the Ta 183. After the war, Multhopp accepted a job with the Glenn L. Martin Company in Baltimore, Maryland. Multhopp was Tank's theoretical advisor who recognized and understood the advantages of the swept wing. **Left middle:** Fact or fiction? It has been reported, though not verified, that the Russians completed several flyable examples of the Ta 183 during the immediate postwar period. In this illustration, a high wing Ta 183 is shown complete with four boundary layer wing fences. **Below:** The first prototype of the Argentinean Pulqui II, designed by Kurt Tank for Juan Perón. Tank's creation featured a high wing design, without boundary layer fences, in direct contrast to the midwing design endorsed by Multhopp. This design change had an profound adverse effect upon the Pulgui II's flight characteristics. The Russians, who benefited from Ta 183 technology, had earlier learned the lesson of wing placement. After exploring both possibilities, they wisely chose the midwing layout for their MiG-15 (see p. 13).

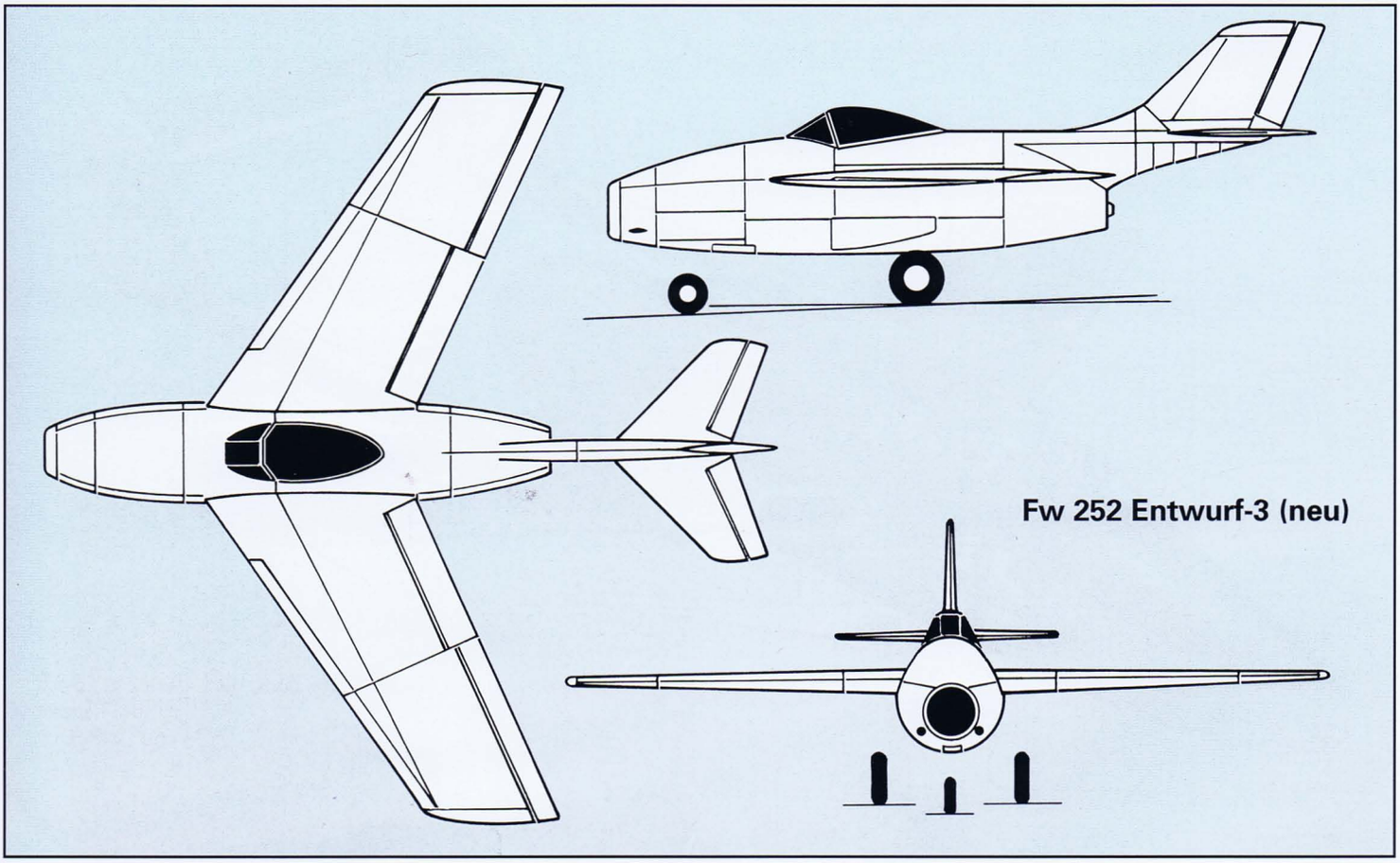




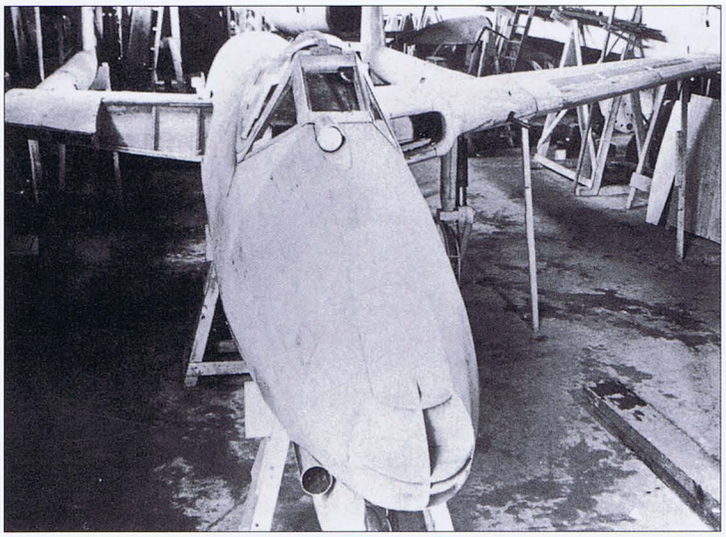
This page: The new Fw Entwurf 3 of January 1944, was known as the Fw 252. This promising fighter project was broadly based upon Plan V, but was larger and heavier than the Ta 183. Keith Woodcock's illustration graphically shows how the Fw 252 would have appeared.

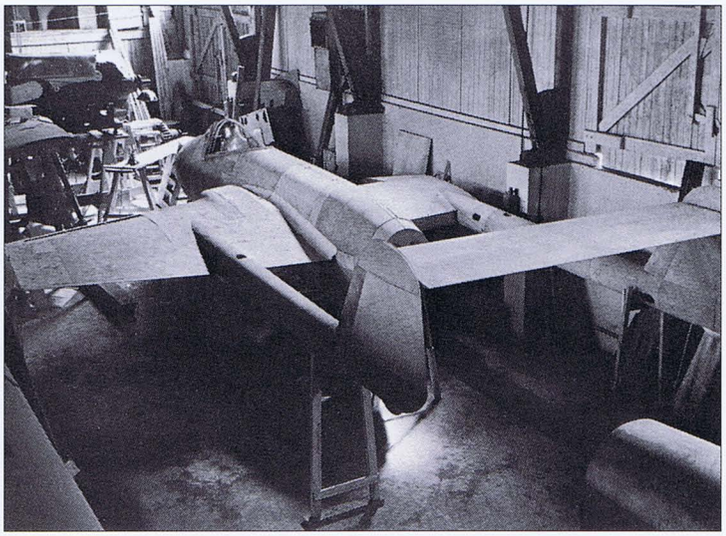


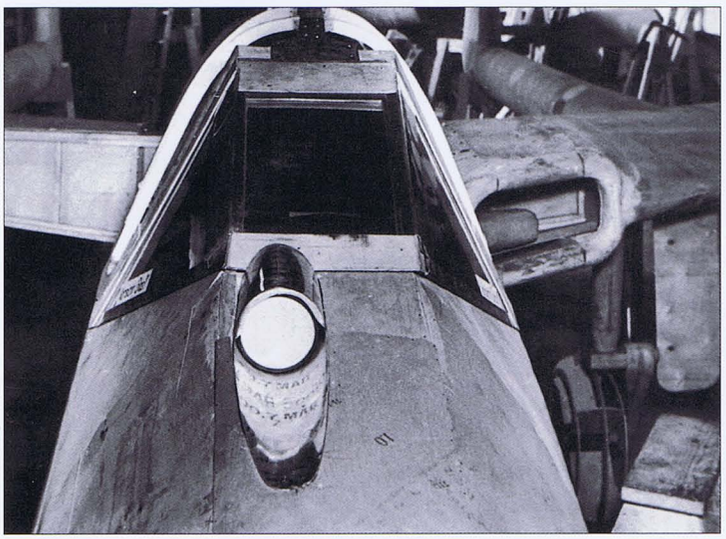
Fw 252 - Draft 3 (New)
February 18, 1945



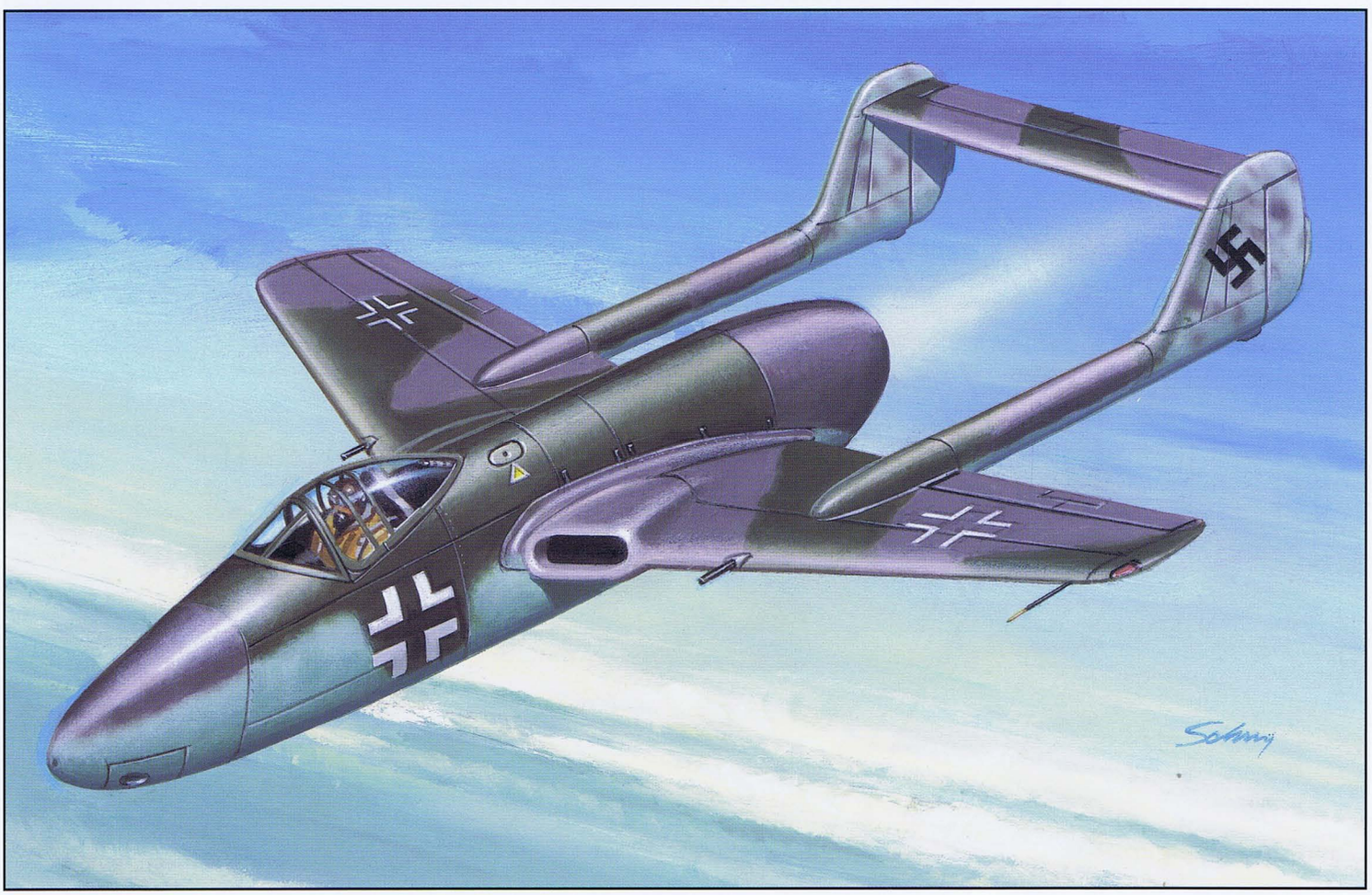
Fw 252 Entwurf-3 (neu)

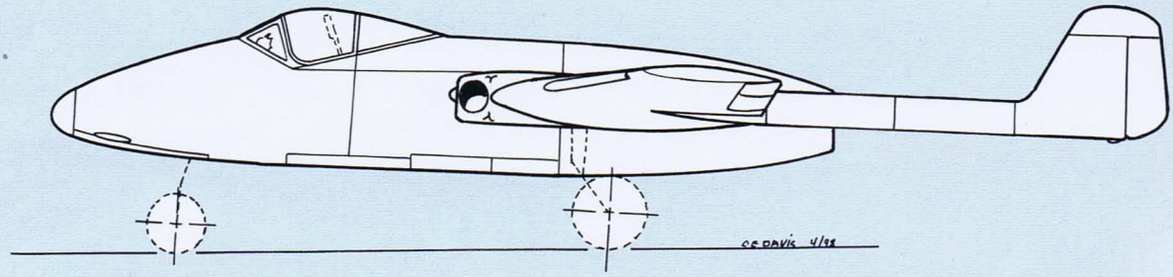


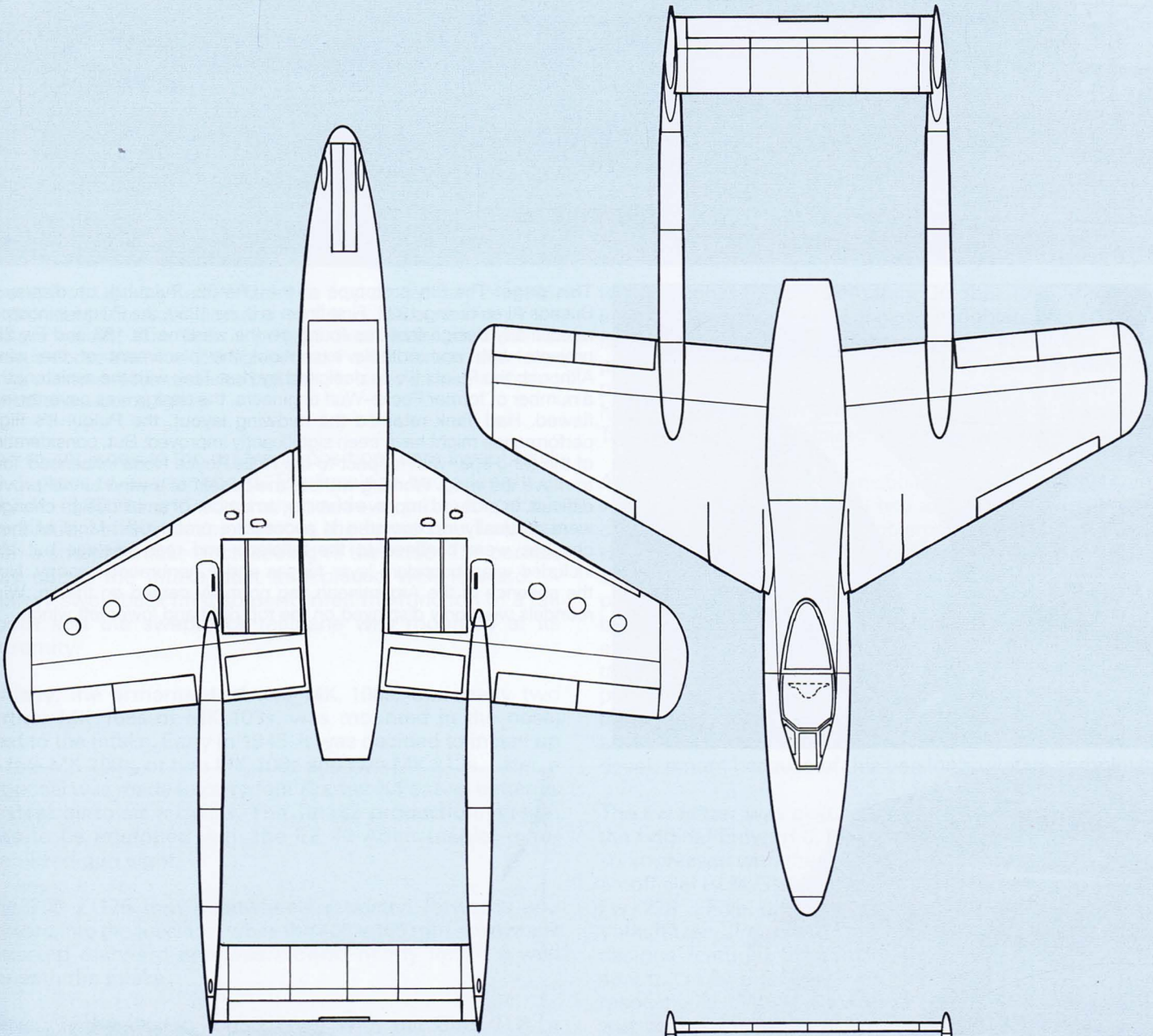


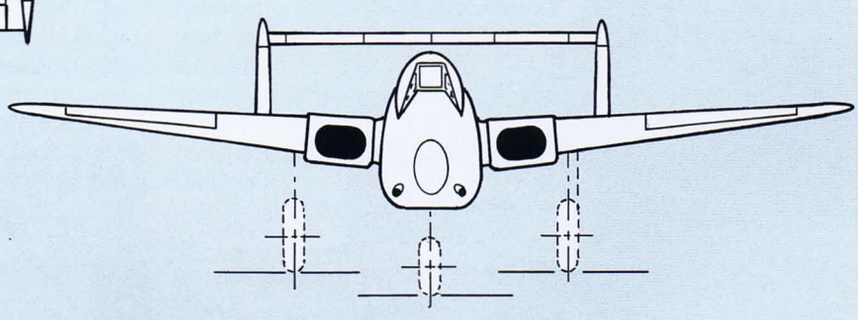


This page and opposite: The Fw 226, Entwurf 6, P VI, Flitzer, of February 1944, was an exceptional project design that was enthusiastically supported by the RLM. The photographs show the full size wooden mockup complete with instrumentation and provision for a ZFR telescopic gunsight.



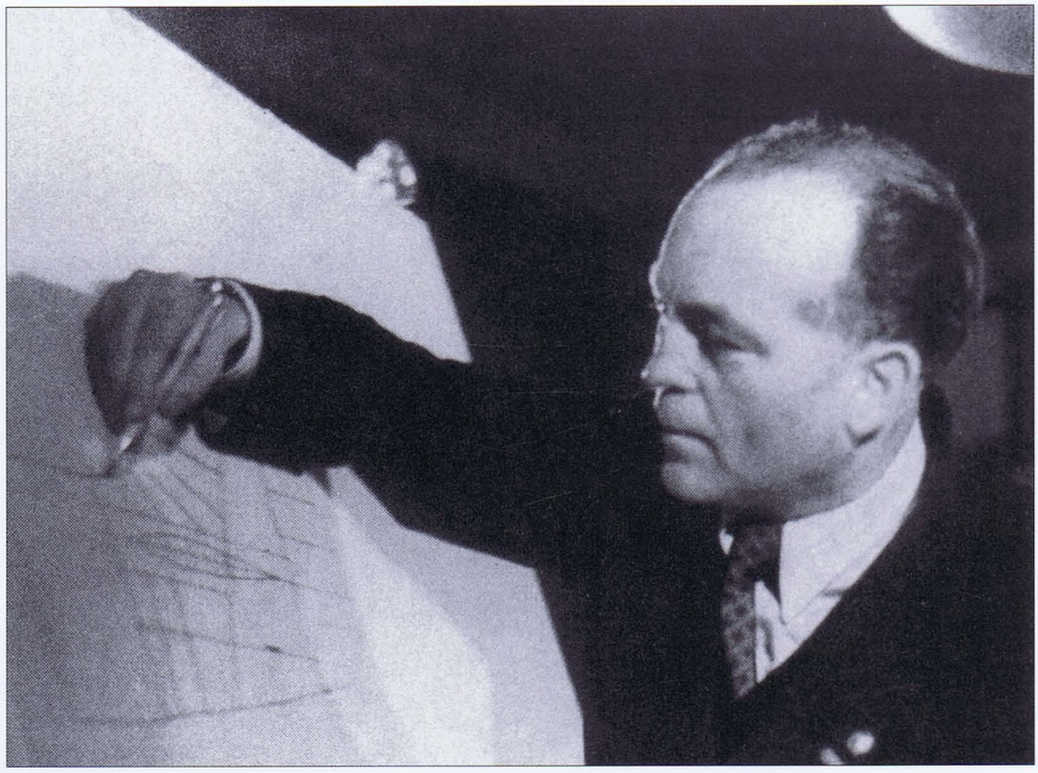






Focke-Wulf Fw 226 - Draft 6
Flitzer - February 1944
1 x HeS 011 A

This page: The 6th prototype of the I.Aé-33, Pulqui II, on display in Buenos Aires during 1997. First flown in June 1950, the Pulqui II incorporated many design features found on the wartime Ta 183 and Fw 252 projects with one notable exception; the placement of the wing. Although the Pulqui II was designed by Kurt Tank with the assistance of a number of former Focke-Wulf engineers, the design was nevertheless flawed. Had Tank retained the midwing layout, the Pulqui II's flight performance might have been significantly improved. But, consideration of the wing spar with respect to the Rolls Royce Nene influenced Tank to move the wing. Working without the benefit of a wind tunnel proved difficult. In order to improve stability, a number of small design changes were gradually incorporated in successive prototypes. Most of these changes were confined to the tailplane and rear fuselage but also included wing boundary layer fences and a nonbraced canopy. Note the absence of the Argentinean flag normally carried on the fin. Wing roundels were only displayed on the top right and lower left wings.



Above: Prof. Dipl.-Ing Kurt W. Tank was born on February 24, 1898, at Bromberg-Schwedenhöhe, the son of a career soldier in the Kaiser's cavalry. Kurt Tank is perhaps best remembered for his famous Focke-Wulf Fw 190 fighter and Fw 200 airliner and long-range maritime reconnaissance bomber. He is shown here sketching the tail of a wartime fighter.

The mainplanes at the midwing position were swept back 40 degrees at quarter chord. The fuselage had a length of 29.2 ft. (8.90 m) and was rather wide in order to permit installation of the turbojet unit in the lower rear fuselage with a straight intake duct leading to the nose. The cockpit was above the intake duct and placed well forward. A sharply sweptback fin also performed the function of a tail boom and the sweptback tailplane was mounted at its extremity.

Initially, the armament of two MK 108s, optionally two further MK 108s or MK 103s, was mounted in the nose, next to the intake. Early in 1945, it was decided to install up to five MK 108s, or two MK 108s and two MK 213s. Later, a proposal was made to carry four Kramer X4 or two batteries of R4M air-to-air missiles. The Ta 183 production version was to be equipped with the EZ 42 Adler (eagle) gyro-stabilized gun sight.

The 700 x 175 mm mainwheels retracted forwards and upward into the fuselage, while the 465 x 165 mm nosewheel retracted rearward and was stowed nearly flat in a well beneath the intake.

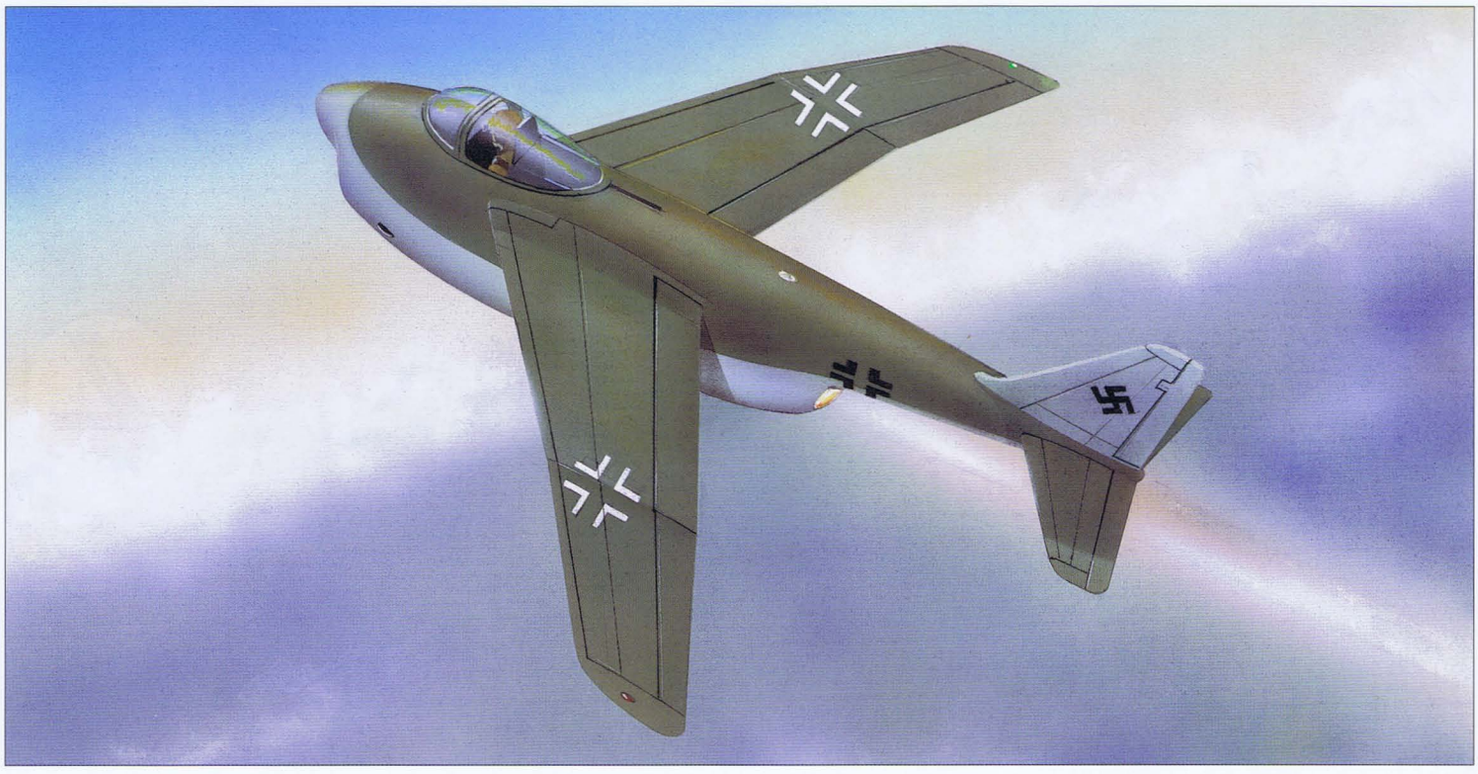
Although the design found favor with the Chef TLR, a number of problems prevented it from entering production. Due to the lack of high-grade material, it became necessary to use steel and wood in its construction. For instance, the wing was of wooden construction with a steel box spar, and a single sheet of plywood formed the covering of the entire leading edge of the wing forward of the spar.

On February 23, 1945, the mass production schedule was finalized at Bad Eilsen. It was intended to begin flight evaluation of the first pre-series aircraft no later than September 1945. The first production model of the Ta 183 was expected by approximately October 1945, the second in early November. A total of eight jet fighters was scheduled for the end of the month, with an additional twenty planned by Focke-Wulf by December 1945. By May 1946, production of the Ta 183 was expected to reach three hundred per month. When the war ended in Europe, the Ta 183 was being prepared for series production.

As with other aircraft designs being developed in 1944, work with the Fw 252 (Entwurf 3) had also been slowed because of continued development problems associated with the new HeS 011A. This high altitude fighter project was essentially an enlarged version of the Huckebein with the cockpit positioned aft. The wing was similar to that of Entwurf 2, but had 35 degrees of sweepback instead of 40. The empennage, however, was more conventional, the sweptback tailplane being placed below the fin and rudder. Although performance was expected to be slightly better than that of the Ta 183, with a top speed of 612 mph (985 km/h) at about 23,000 ft. (7,000 m), It was not selected for continued development because of this version's relative complexity.

The Fw Flitzer was also energetically developed as part of the original Entwurf 6, Plan VII, design draft. The RLM was so impressed with the Flitzer that it approved assigning the an official RLM GL/C number to the project, becoming the Fw 226[4]. Five different versions of the Flitzer, plus a Volksflitzer (People's Dasher) were designed. These designs featured three different wings having spans of 45.9 ft. (14.00 m), 50.8 ft. (15.50 m), and 55.8 ft. (17.00 m), respectively. With the exception of the Volksflitzer, which was to be powered by a BMW 003, the others were all designed for the HeS 011 jet engine. Most of the design work was finalized by October 1944. The armament consisted of two MK 108s with a total of 160 rounds. It had an estimated maximum ceiling of about 46,000 ft. (14,000 m) as well as a maximum horizontal speed of 560 mph (900 km/h).

4 The RLM GL/C number 226 had previously been assigned to Blohm & Voss for their BV P 200, a large eight-engined civil flying boat project that was never built. In 1944, number 226 was briefly assigned to the Horten brothers for their H VII twin-engined flying-wing trainer, as the Ho 226. But, with the decision to produce the Flitzer, the number 226 was withdrawn from Horten and finally passed to Focke-Wulf. The H VII then became the Ho 254 displacing that number previously used by Focke-Wulf for their projected Ta 254 night fighter.



Above: Bob Boyd's impression of the Heinkel He P 1078 A shows the aircraft's graceful lines to full advantage. The aircraft would have been armed with two MK 108 cannon, one on each side of the cockpit with provision for automatic triggering.

At the end of April, 1945, the Focke-Wulf design department was forced to shut down when Allied ground forces reached Bad Eilsen. A few days previously, most of the documents covering the development of Focke-Wulf's advanced designs were burned. However, duplicates had been sent to the Deutsche Versuchsanstait für Luftfahrt – DVL (German Aeronautical Research Establishment), Chef TLR, and OKL (Oberkommando der Luftwaffe – Luftwaffe High Command) at the time of the last fighter completion held in early 1945.

These documents were eventually uncovered by Russian occupation forces at the DVL in Berlin-Adlershof. Additional files were found in the large RLM headquarters building in Berlin.

In the autumn of 1945, Professor Kurt Tank was out of work and uncertain about his future. Out of curiosity he met with Col. Lukianov of the Soviet Military Intelligence (GPU) and Col. Tulpanov, of the Soviet Propaganda Office, who were eagerly hoping to recruit Prof. Tank. But highly distrustful of the Russians and their agenda, Tank declined to enter into any kind of contract.

Another advanced project was the Heinkel He P 1078A, identified as a Jagdflugzeug mit HeS 011-Strahlatrieb (Fighter with HeS 011 turbojet engine), three radically different versions of which were eventually designed. The He P 1078A was a single-seat, single-jet fighter, with three different versions being advanced during May 1945. The first design had a shoulder gull wing, that was swept back 40 degrees, as well as a swept back fin and tailplane. A HeS 011 turbojet was to be mounted low in the fuselage and connected to the single nose intake by a slightly curved duct, extending 8.4 ft. (2.55 m). The cockpit was placed far forward in the nose above the air intake.

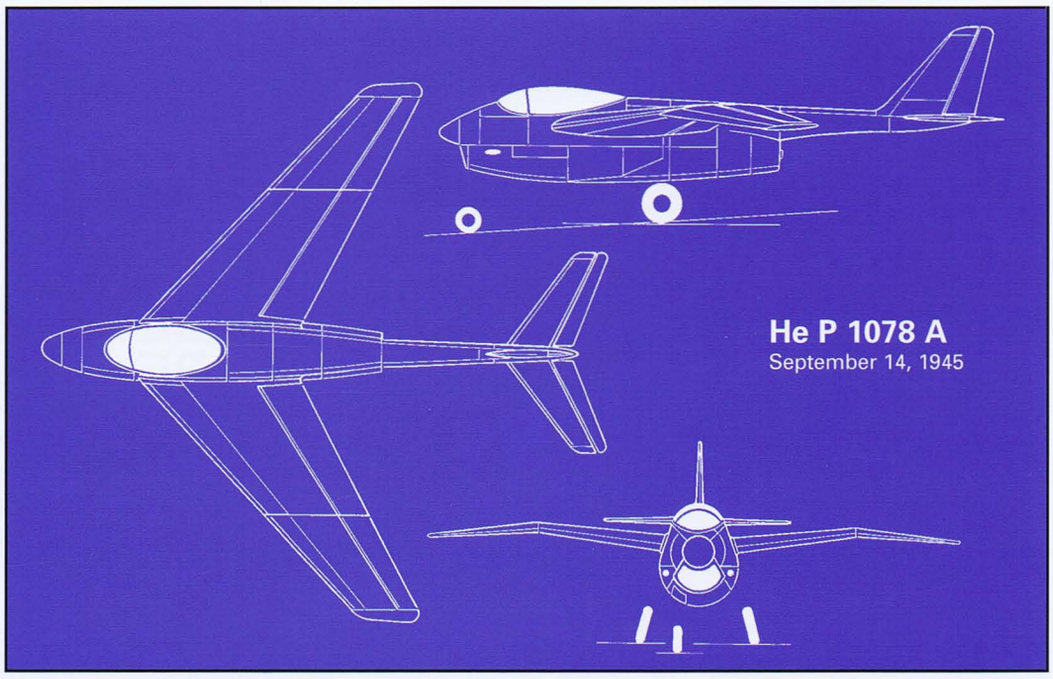
The design's armament consisted of two MK 108 guns, one on each side of the cockpit, with provision for automatic weapon triggering when the target was within the fighter's effective range. The main undercarriage retracted upward and forward into the fuselage. The offset nosewheel retracted rearward and upward on the starboard side of the intake duct. There was to be a large self-sealing fuel tank compartment extending across the fuselage into the wing roots, and a smaller separate tank farther back in the upper fuselage of the P 1078A. Because the performance spectrum of the P 1078B and C promised increased speed and a higher ceiling, the first project stage was terminated without waiting for orders from the Chef TLR.

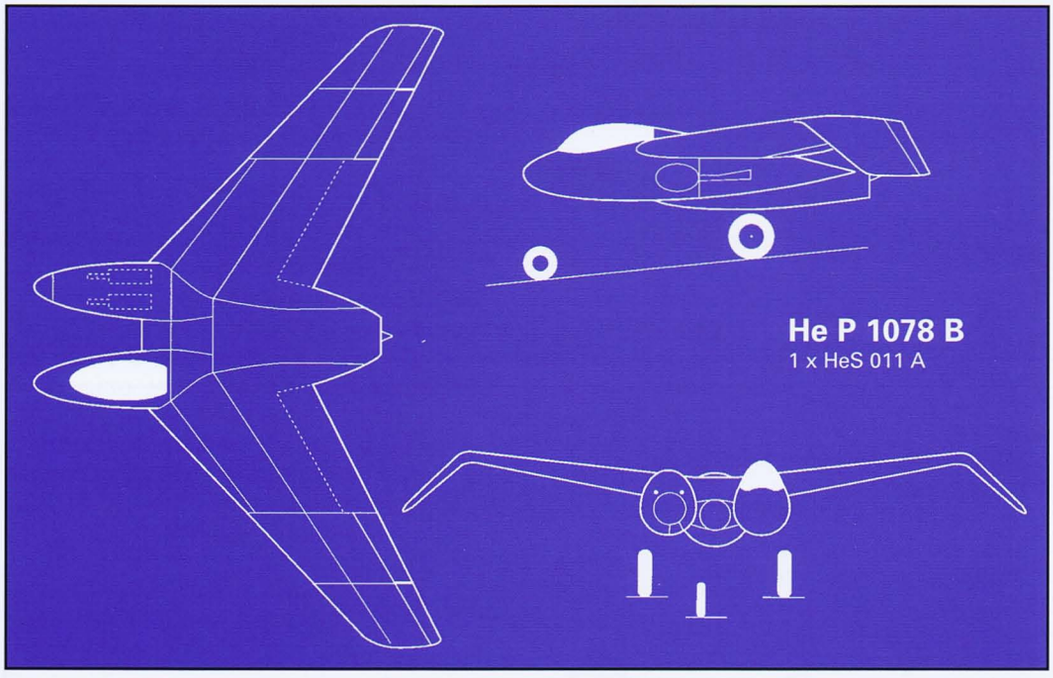
The Blohm & Voss BV P 210 einmotoriger Turbinenjäger (single-engine jet fighter) was another project featuring wing sweepback. The main fuselage member was a tubular steel former from which the turbojet unit was suspended. The former extended rearward and was bent upward to carry the tailplane, and was suitably faired. The BMW turbojet was fitted far to the rear of the front fuselage, the air being fed to the engine through a tunnel in the nose and ejected under and forward of, the tailplane. Both the tailplane and the elevator were of the usual type with the leading edge swept back and the trailing edge being straight.

The fixed armament was installed beneath the cockpit and consisted of two 30mm MK 108 cannon mounted on either side of the air intake. The mainwheels of the tricycle undercarriage retracted into the underside of the mainplane beneath the fuselage, the wheel doors being part of the P 210's undersurfaces. The designers estimated that the P 210 would reach 535 mph (860 km/h) at an altitude of 26, 250 ft. (8,000 m). At maximum thrust, the climb rate at sea level was about 3,300 ft. per minute (1,000 m/min), and 1,230 ft./min. (375 m/min.) at 23,000 ft. (7,000 m), compared with about 2,560 ft./min. (780 m/min) of the Me 262 A-1a. This performance did not meet the requirements of the Chef TLR, and the design was immediately canceled.

Another interesting project from Blohm & Voss was their BV P 198. This high-wing fighter project was initially designed to take a BMW 003 turbojet (as the BV P 198.01.1), but Dr.-Ing. Richard Vogt, fearing the 003 would not deliver

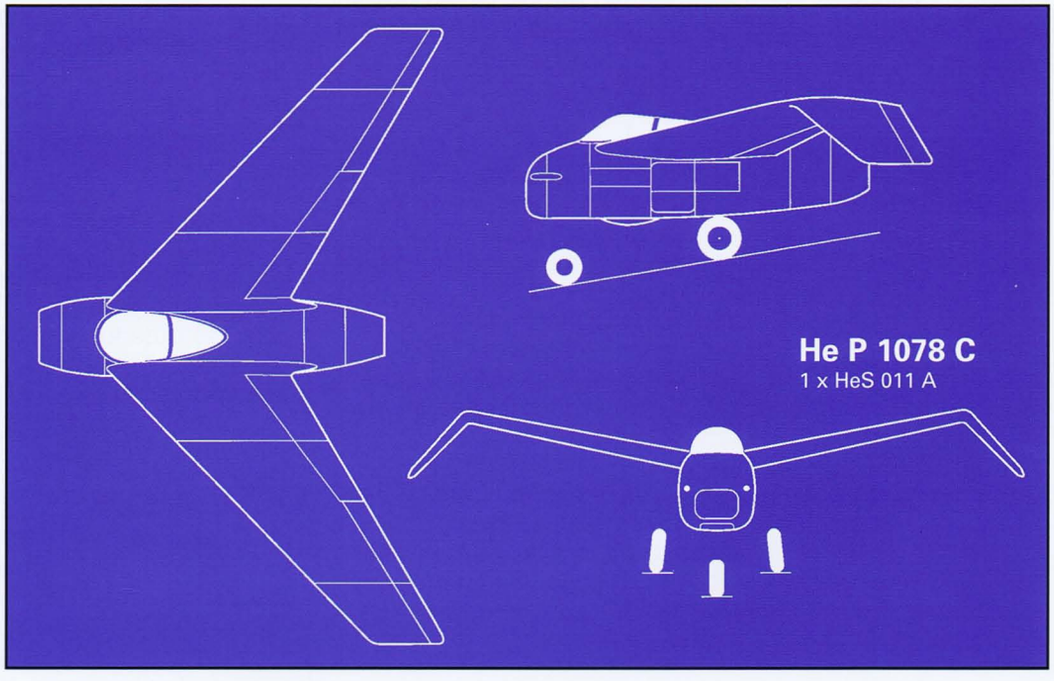
Right: The He P 1078 A was to be a single-seat jet fighter powered by a single HeS 011 mounted in the lower portion of the fuselage. It also featured a 40 degree sweptback gull wing and a nosewheel offset to starboard.

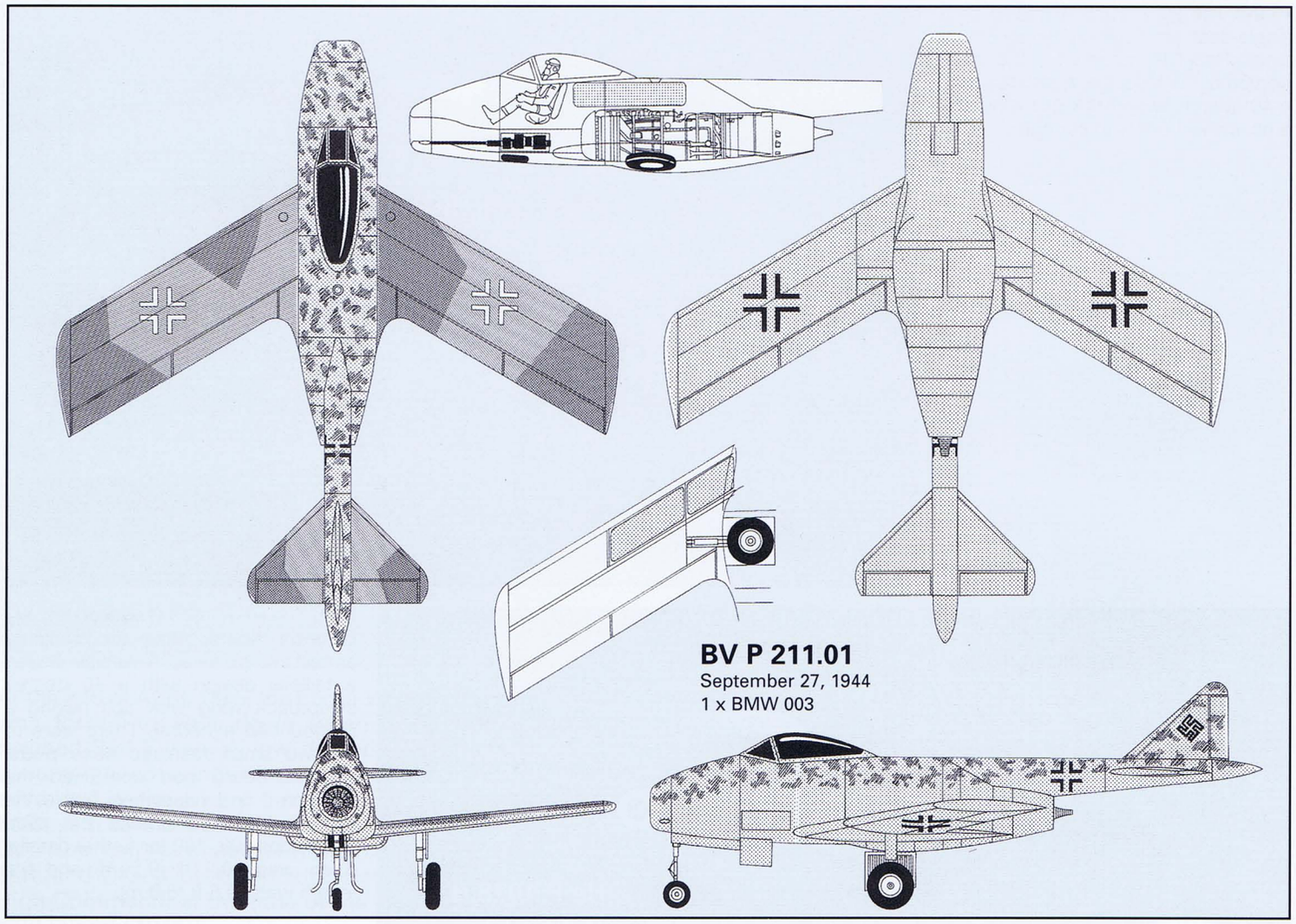




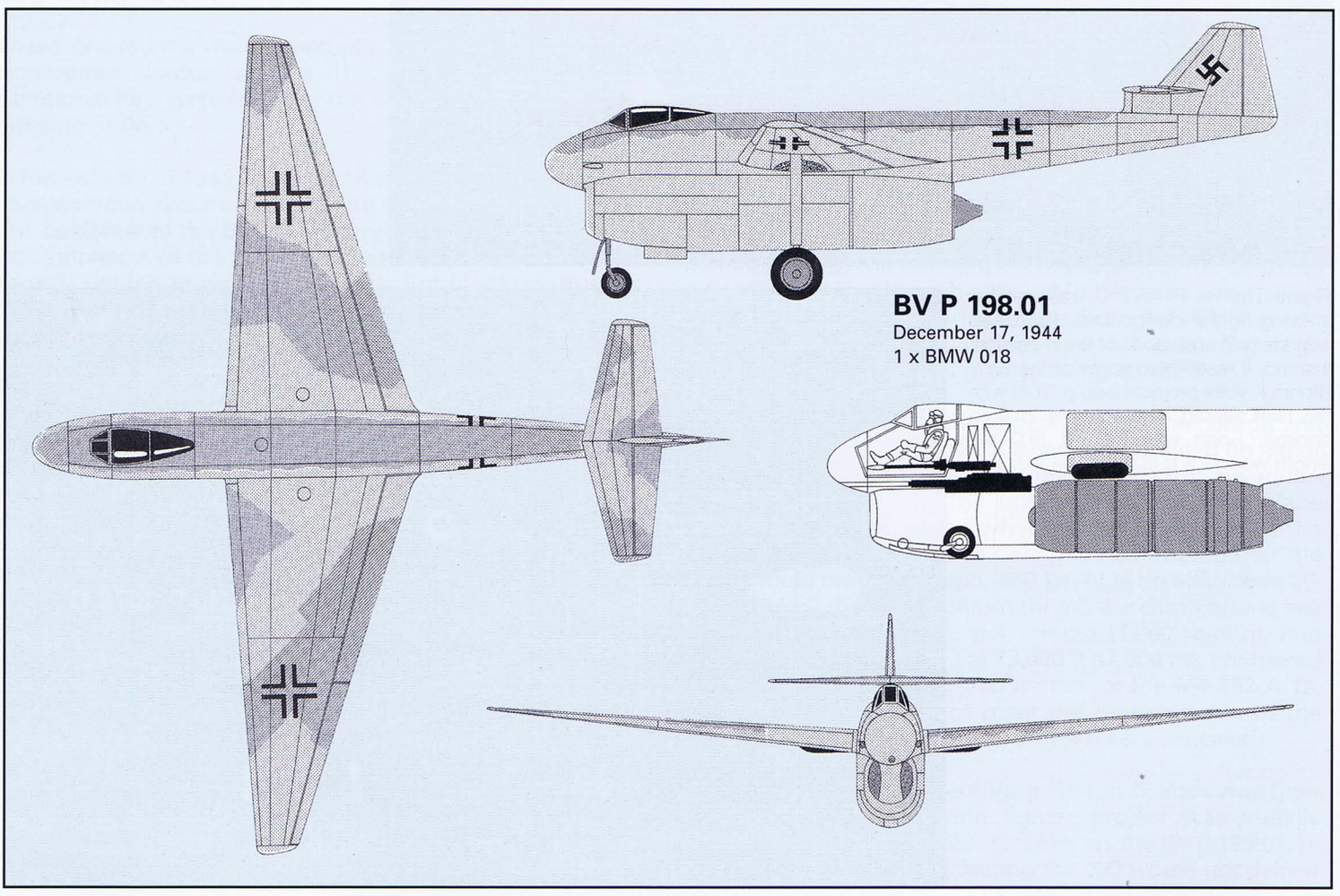
Left: The He P 1078 B was an entirely different fighter than the similarly armed and powered A-version. It was a tailless design with a 40 degree sweptback wing with tips having a pronounced anhedral. There were to be two small fuselage nose pods. The starboard pod contained the armament and nosewheel, while the port pod accommodated the pilot. See pages 108, 109 for further details. Span was 30.2 ft (9,2 m) and the length was 19.6 ft (6,0 m).

Right: The He P 1078 C was another all-wing fighter design that dispensed with the twin nose pods of the B-version. Instead, it resembled some of the early Blohm & Voss projects (see p. 104) with the pilot seated in a centrally located cockpit. Span was 29.5 ft (9,0 m), length was 19.6 ft (6,0 m).





BV P 211.01
September 27, 1944
1 x BMW 003



BV P 198.01
December 17, 1944
1 x BMW 018

Above: Prof. Willy Messerschmitt (left) confers with Gerhard Fieseler while Messerschmitt test pilot, Willi Stör, looks on.

enough power, slightly reworked the design to accommodate the larger BMW 018 A-1.

One of the most potentially powerful fighters designed by Blohm & Voss was the BV P 198.01.2 Höhenjäger mit BMW 018. Only a few parts and some experimental sections of the engine were manufactured in 1945. Fuel consumption of the BMW 018 was estimated to be twenty percent lower than that of the thirsty BMW 003. The maximum thrust permitted speeds of about 530 mph (850 km/h) at 44,300 ft. (13,500 m). A combat ceiling of 59,000 ft. (18,000 m) was to be reached within eleven minutes. Endurance at this altitude was two hours. The armored cockpit was located far forward in the nose and seated only the pilot. The armament consisted of one heavy MK 412 and two additional MG 151/20 cannon.

A second version was developed with a swept back wing and a modified tail section as the BV P 198.02 which was expected to perform better than the first design. At 59,000 ft. (18,000 m), it was supposed to reach a top speed of 550 mph (885 km/h), while the BV P 198.01 could only reach 485 mph (780 km/h) under the same conditions.

Meanwhile, Messerschmitt's engineers completed two advanced Me 262 developments (the Me P 1099 and Me P 1100) early in 1944, and then turned their attention to the Me P 1101 during the summer months. It is remarkable that no less than ten totally different concept studies were created under the umbrella designation P 1101. At least half of them involved multi-engine designs utilizing many innovative wing plans. These Me P 1100 are summarized on page 49, and some of the more unusual ones include the following:

1. A fighter with sweptback wings (35 or 40-degrees) with two turbojet units fitted underneath.
2. A fighter with sweptback outer wings, its forward panels being swept forward (two jet units were installed under the wings).
3. A fighter with a Jumo 222 piston engine and pusher propeller (Project Me P 1101/97 of May 25, 1944).
4. A vertical takeoff fighter with a rotor system designed by Prof. Focke that did not differ much from the postwar Me P 408 Rotor-Jet project.
5. A fighter with adjustable wings that was designed in July 1944.

All of these designs, however, remained on paper. In 1944, the German military leadership was forced to accept that diminishing resources did not allow the mass production of advanced fighter aircraft. By the end of 1944, only second-rate materials were available. In addition, the Jägerstab demanded the production of a single-seat jet fighter with improved performance and a higher combat ceiling. On July 10, 1944, Professor Heinkel voiced the opinion that the superiority of the Me 262 would end when enemy jet fighters made their operational appearance. It would therefore be essential to construct an inexpensive but fast single-seat jet fighter with a minimum armament of two heavy 30mm cannons or other effective weapons. Messerschmitt also insisted on a light weight fighter which could operate from short runways and with a deteriorating communications network.

When the Technische Amt (Technical Department) of the RLM compiled a list of requirements, it called for a single-seat fighter which could be easily converted into a two-seater. Also, the Chef TLR suggested the installation of an auxiliary rocket engine to reduce climbing time to the combat ceiling.

The Oberbayerische Forschungsanstalt (Upper-Bavarian Research Institute), the code name given the Messerschmitt design office after its evacuation to rural Bavaria near Oberammergau, was working on the design of a powerful single-seat jet fighter, the Me P 1101/XVIII TL-Jäger mit HeS 011. The first of a series of new designs was finished at the end of July 1944. It was a fighter with a V-tail and two circular air intakes alongside a fully glazed pilot's cockpit in the front fuselage. A length of 22.5. ft. (6.85 m) and a wingspan of 23.5 ft. (7.15 m) was specified. The aircraft was powered by one HeS 011 and designed for a top speed of 652 mph (1,050 km/h) at 19,685 ft. (6,000 m).

Above: A gathering at Messerschmitt's Lechfeld facility in 1944 during which General Galland (center with striped trousers) flew the Me 262. Others include, from left to right, Herr Degel chief of the Me 262 flight program, Herr Zeiler test pilot, Herr Wöckner test pilot, the three to Galland's right are unknown, Gen. Galland, Herr Caroli chief of flight testing, Prof. Messerschmitt, Herr Dir. Bauer civil aviation and an unknown. The two Luftwaffe and one Army officer are unknown.

The offensive armament consisted of only two MK 108s, a warload of 1,100 lb. (500 kg) could be carried under the fuselage.

On August 22, 1944, project engineer Herr Thieme, one of Hans Hornung's team of experienced designers, developed the Me P 1101/XVIII-112, a small jet fighter with one HeS 011 turbojet unit installed in midfuselage. It featured the typical Messerschmitt V-tail, as tested earlier on the Bf 109 G-0, W.Nr. 14003, VJ+WC.

Only eight days later, on August 30, 1944, an improved variant with a slim fuselage was designed at Oberammergau. It was designated Me P 1101/XVIII-113 Turbinenluftstrahl-Kampfjäger (turbojet fighter bomber), and became one of the precursors of the later Me P 1101 designs. Either one MK 112, two MK 103s, or two MK 108s could be fitted in its forward weapons bay. The proposed design had the outer wings of the standard production Me 262 A-1a and was submitted to the Technisch Amt early in September 1944. It was suggested that either a HeS 011 or a Jumo 004C turbojet should be installed.

On December 14, 1944, a technical description of the definitive Me P 1101 was compiled. It possessed the outer wings of the Me 262, and was powered by one Jumo 004 B-2 turbojet engine. This would later be replaced by a pre-production HeS 011. The first practical step toward realization of the final P 1101 was a model with a wingspan of 6.6 ft. (2.00 m), which was tested in the Berlin-Adlershof wind tunnel. Further very useful tests were carried out at the AVA (Aerodynamische Versuchs-Anstalt – Aerodynamic Test Establishment) at Göttingen and the LFA (Luftfahrt-Forschungsanstalt – Aeronautical Research Establishment) at Brunswick-Völkenrode.

Tests on a production Me 262 A-1a, fitted with a modified air intake tube, were undertaken early in November 1944, to determine the loss of thrust relative to the length of the proposed air duct. Later, different versions of a sweptback wing were investigated. Finally, the two-piece wing with steel spars, and wooden ribs and skin, and a sweepback of 40 degrees, was selected; leading-edge slots and simple camber-changing landing flaps were fitted. The pressurized cabin was located far forward in the fuselage followed by the fuel tanks, undercarriage stowage, and a tail cone with an equipment bay. The tricycle undercarriage retracted into the fuselage.

The armament, consisting of two or four MK 108s with 100 rpg was placed on each side of the cockpit. Missile carrying capacity was later proposed to improve the fighting qualities of the Me P 1101. The performance was calculated by Hans Hornung and his team between November 11, 1944, and February 22, 1945. The first experimental prototype was to be powered by a Jumo 004 B-1 turbojet. Later, the more powerful HeS 011 A-1 was to be used. This would have increased speed to approximately 612 mph (986 km/h). The proposed production aircraft would have had a fixed armament of four MK 108 cannon.

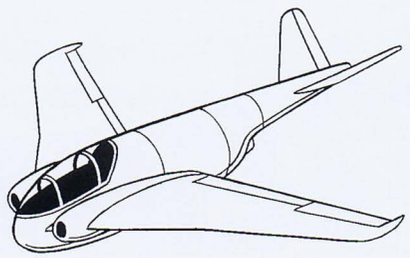
Walter Keidel, who had joined Messerschmitt in March 1932, was to be chief of assembly. He also was responsible for handling all queries regarding this aircraft type in the prototype production department, in the detail design department, and during subsequent testing. He was assisted by Kreidel Körner, Paul Barmayer and many others. During the last weeks of the war, this team also was engaged in converting the Me 262 to carry R4M missiles, testing the 50 mm cannon on the Me 262 A-1a/U5, and investigating all aspects of possible weapons installation in the P 1101, P 1106 and P 1110 projects. Great chaos reigned during the last few days under German management. In spite of every conceivable obstacle, the first experimental Me P 1101 V1 was nearly completed when Allied troops arrived in late April 1945. The Messerschmitt P 1101 V1 had been fitted with a wing of variable sweepback for test purposes. Sweep angles of 30,40 and 45 degrees cold be set on the

25 MAY 1944

?

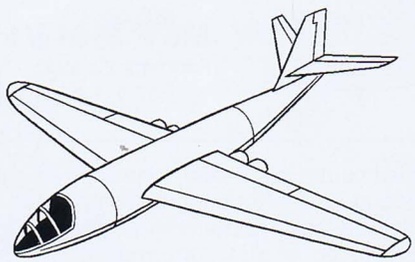
Me P 1101 / 97

24 JULY1944



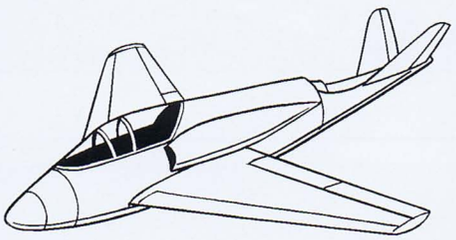
Me P 1101 / XVIII

29 JUN 1944



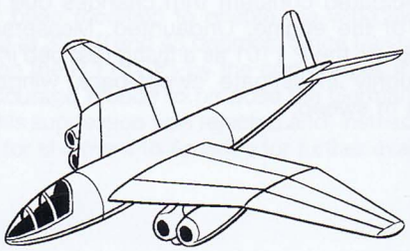
Me P 1101 / XVIII – 103

22 AUG 1944



Me P 1101

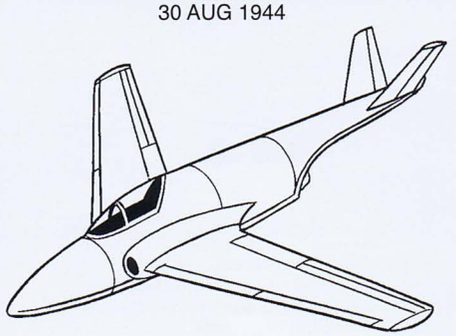
1 JUL 1944



Me P 1101 / XVIII – 104

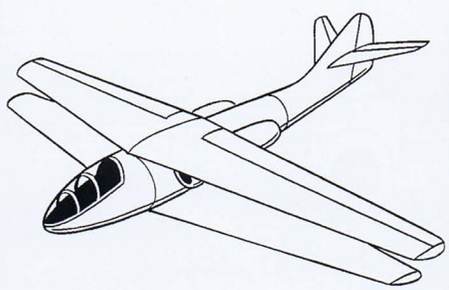
P1101

30 AUG 1944



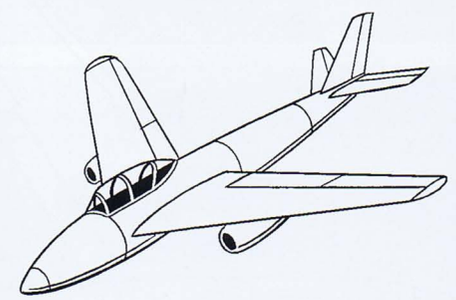
Me P 1101 / XVIII – 113

11 JUL 1944



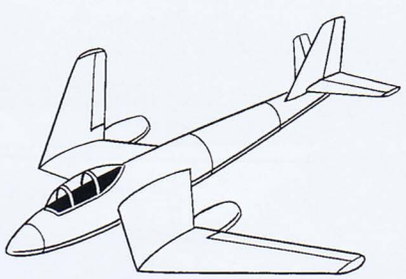
Me P 1101 / XVIII – 108

AUG 1944



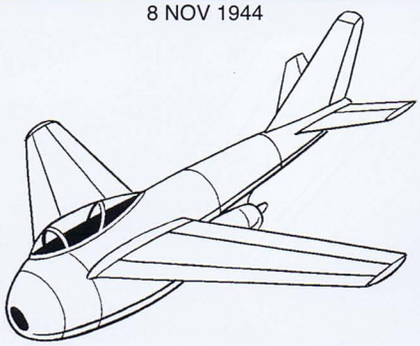
Me P 1101

AUG 1944

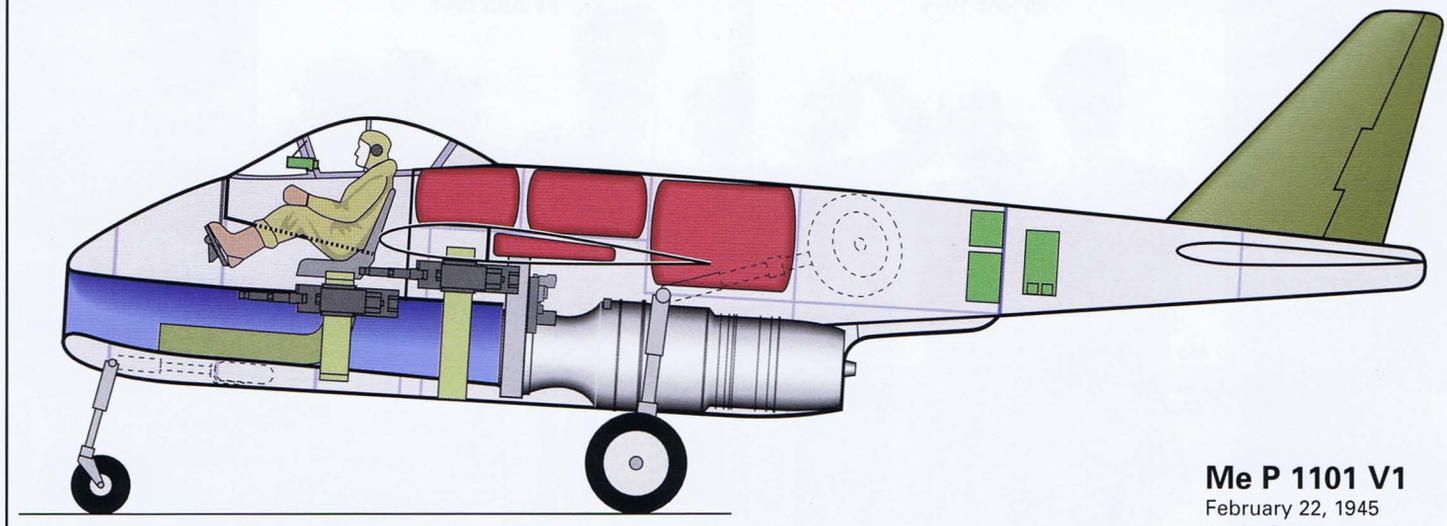


Me P 1101

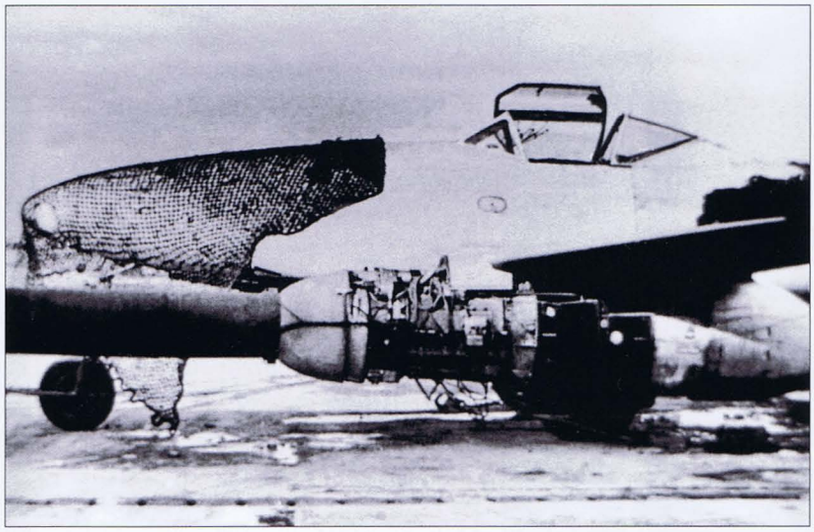
8 NOV 1944



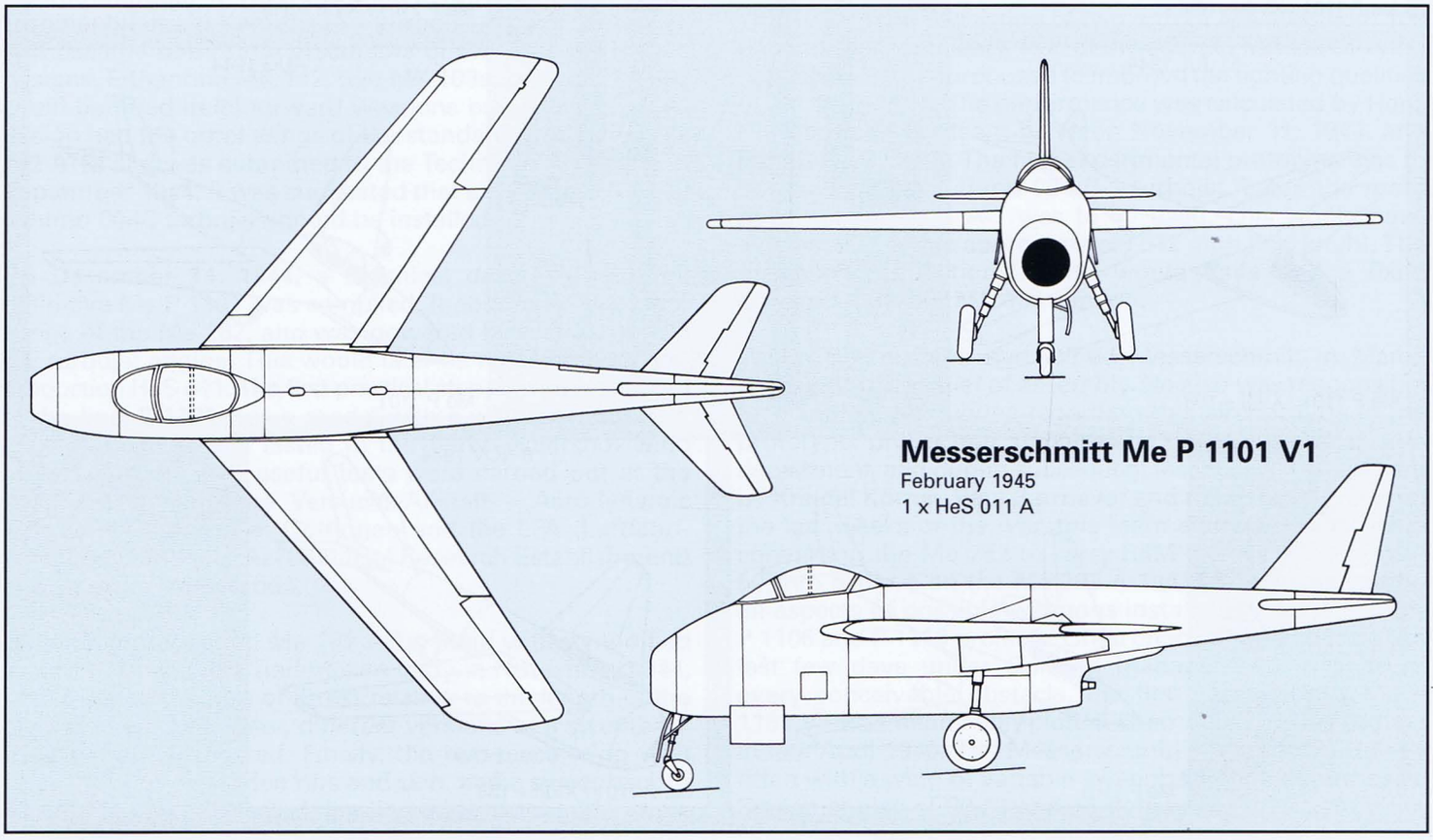
Me P 1101 / XVIII – 138



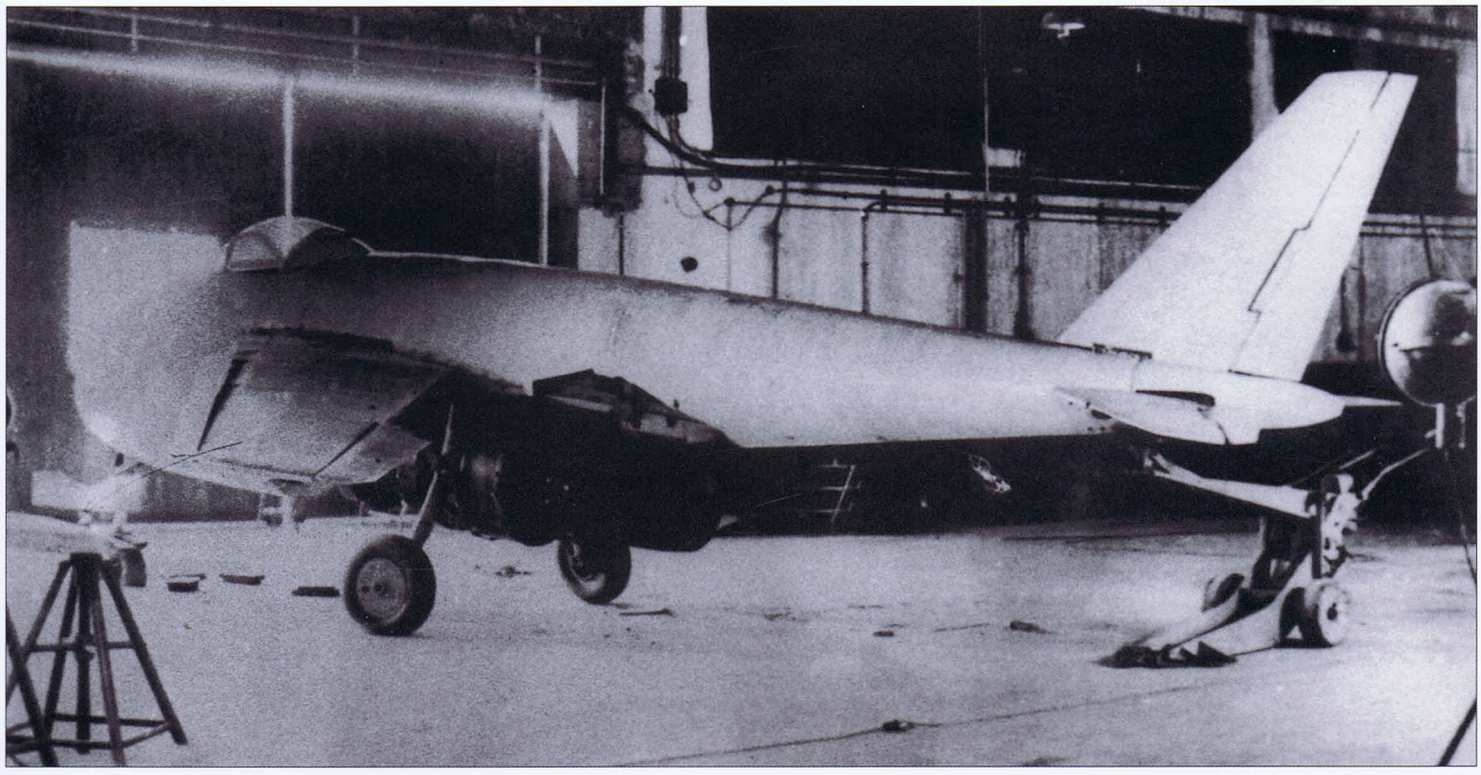
Me P 1101 V1
February 22, 1945
1 x HeS 011 A



Left: Seven experimental air intake tunnels were ground tested on Me 262s at Lechfeld during November 1944. The purpose of the tests was to determine if long air delivery tubes adversely affected engine performance. The results indicated no significant performance loss. The Me P 1101 evolved into one of the most advanced fighter projects before the end of the war. Considerable research time was spent in perfecting the final design (shown above and below). The Air Ministry rejected the Me P 1101 as fighter because of anticipated constant trim changes due to the low thrust line of the engine. Undaunted, Messerschmitt decided to complete the P 1101 as a flying test bed in order to more thoroughly investigate swept-back wings with varying degrees of sweep.

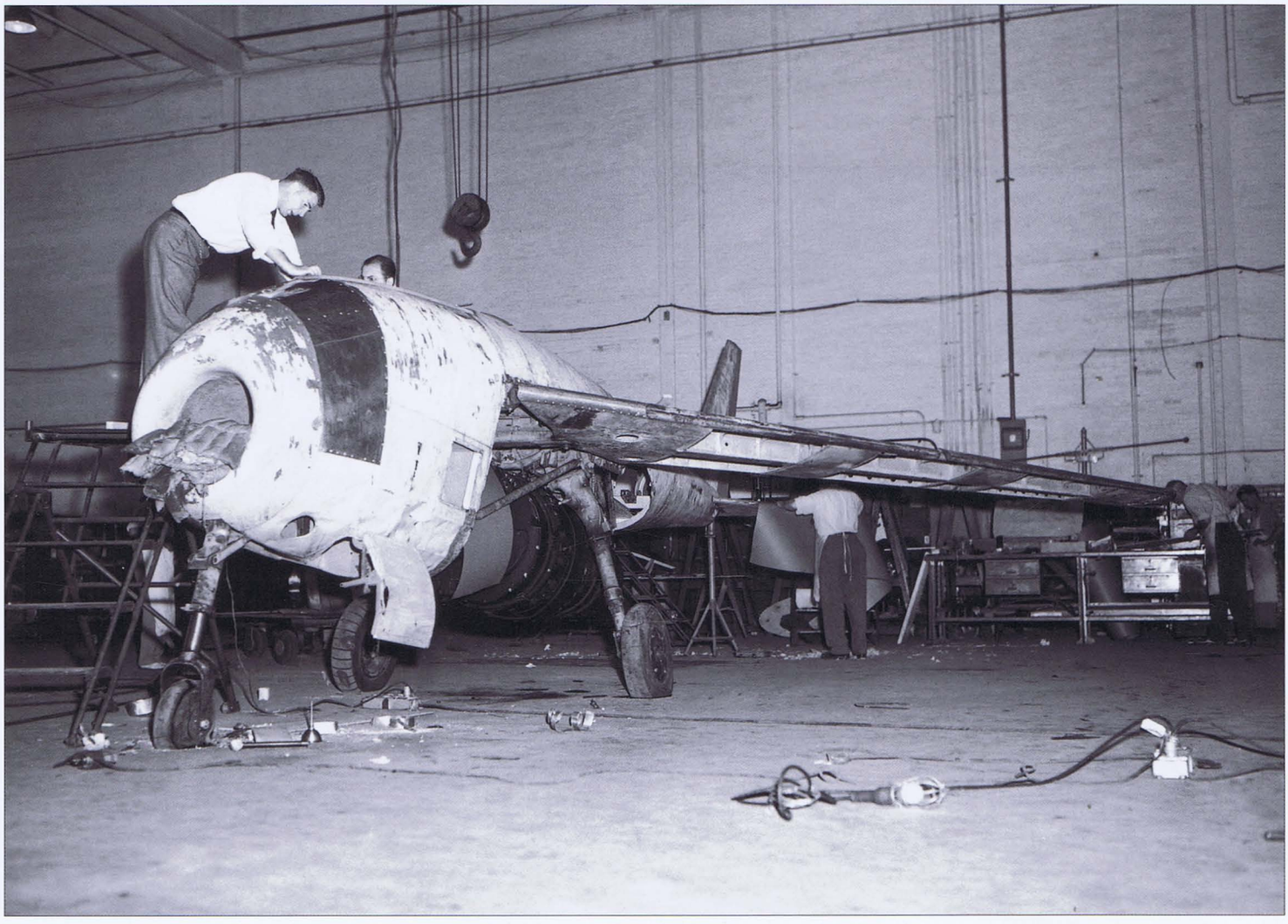


Messerschmitt Me P 1101 V1
February 1945
1 x HeS 011 A

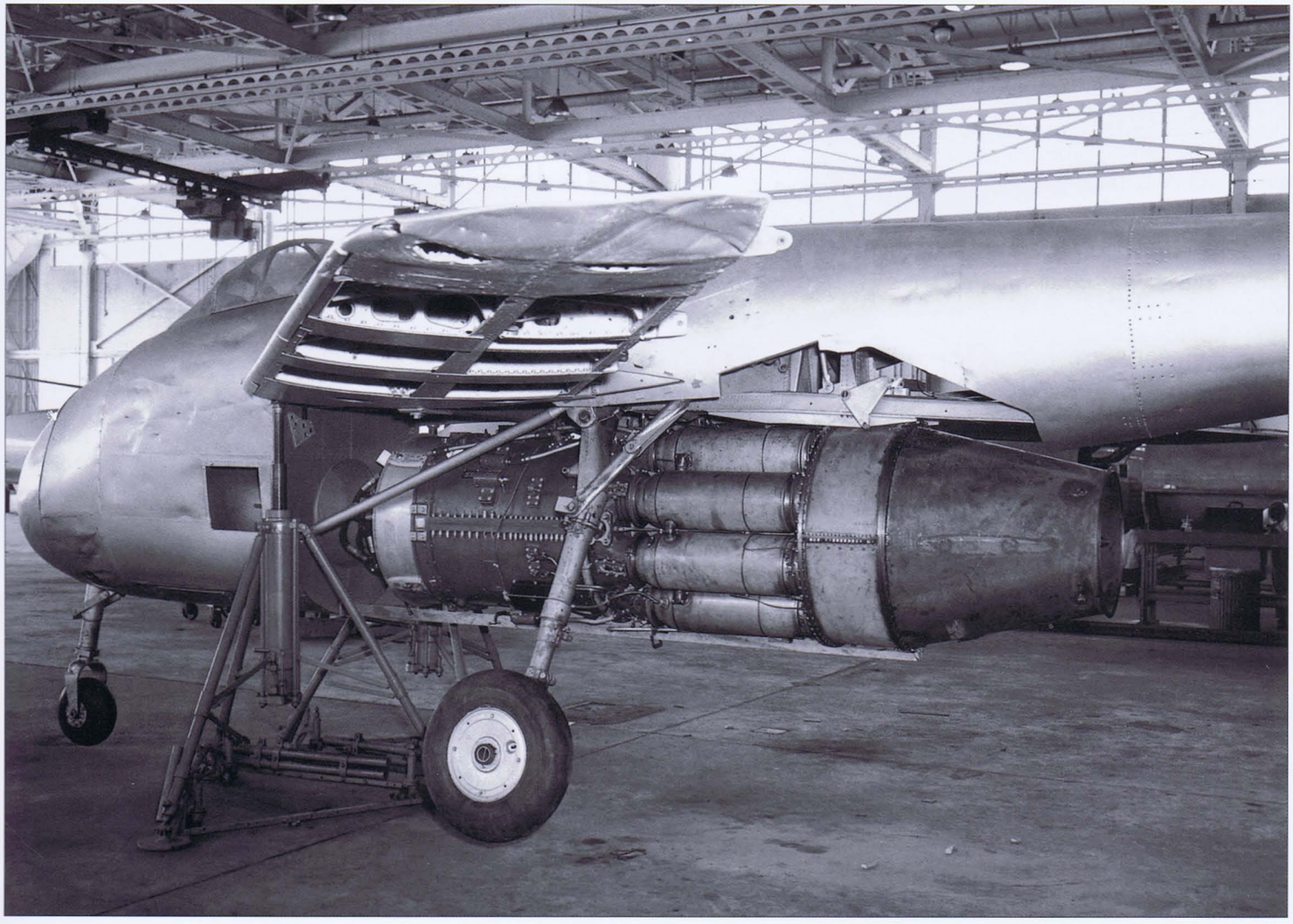


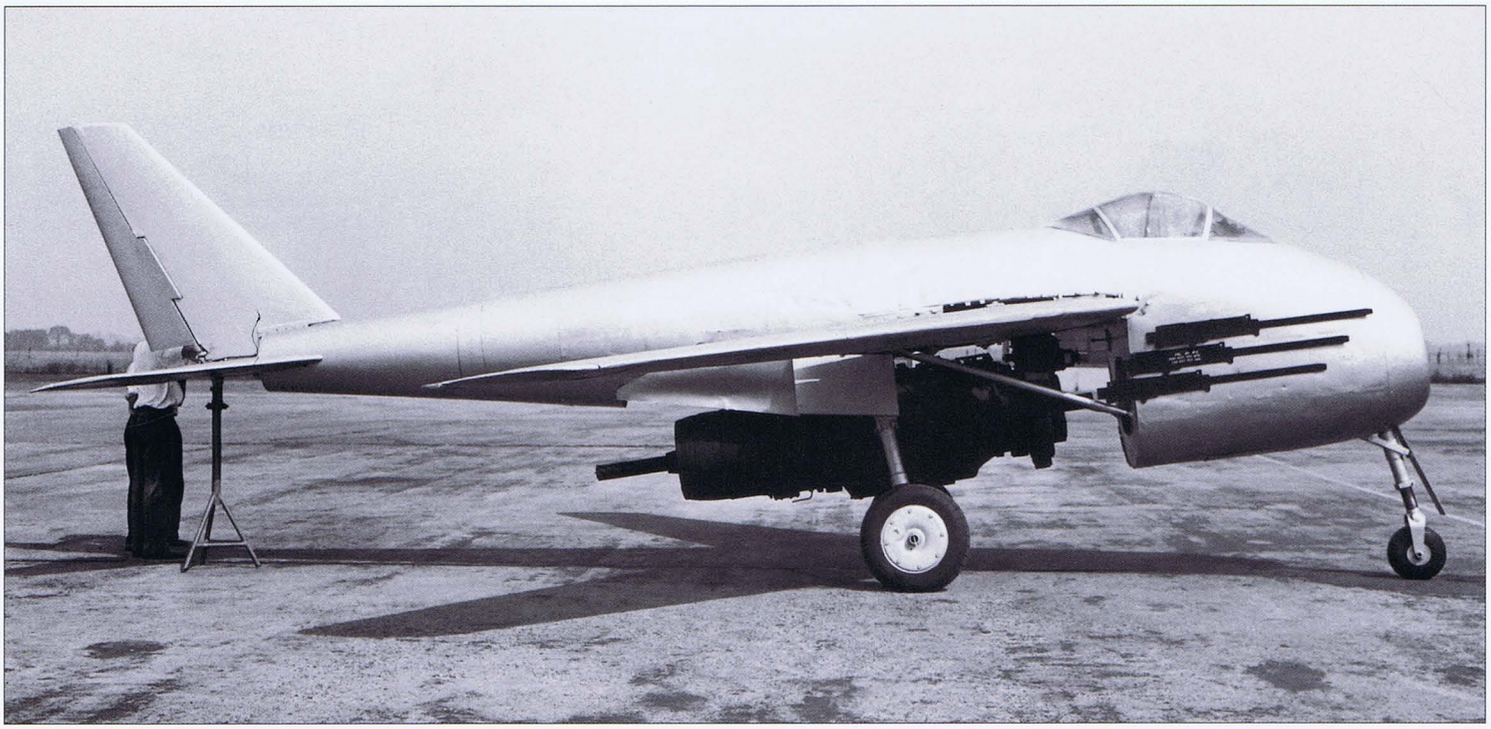
This page: Captured at Oberammergau on April 29, 1945, the Me P 1101 V1 intrigued Robert J. Woods, Bell Aircraft Corporation's chief design engineer, who had arrived with the first contingent of Americans. In particular, he was impressed with the variable swept wing that had earlier been modified to enable the wing sweep to be preset on the ground at 35, 40 and 45 degrees. Since Messerschmitt had not finished work on the P 1101 V1 by the end of April, it was sufficiently complete to encourage Woods to propose the Germans be allowed to finish the job. This suggestion was rejected and, instead, the prototype was made ready for shipment to America for further evaluation.

Above and opposite above: Günter Sengfelder's thoroughly convincing model of the Me P 1101 as it would have appeared had Messerschmitt completed construction before the end of the war. The Germans had planned to complete the Me P 1101 V1 during June 1945, but time ran out before this goal was reached. The prototype was shipped to Wright Field where it was examined, but not completed. **Below:** After sitting dormant for two years, it was acquired by Bell and transferred to their Buffalo, New York plant. Bell engineers are shown discussing the aircraft's restoration while workmen replace damaged sheet metal and fabricate missing components. Although Bell had initially hoped to bring the prototype to flying status, it was realized that this plan was impractical. Instead, Bell planned to use the P 1101 as an instructional vehicle for their own X-5 project.



Below: After partial restoration of the Me P 1101 V1, Bell engineers substituted the original German HeS 011A for the American Allison J-35. Although the J-35 was a slightly larger and heavier engine, it was successfully adapted to the German airframe. This engine generated 3,750 lb (1,705 kg) static thrust in contrast to 2,860 lb (1,297 kg) thrust of the HeS 011A. Woldemar Voigt, who was head of Messerschmitt's project pre-design department, was brought to American under Project Paperclip, largely because of his work on the Me P 1101. He worked closely with American engineers while at Wright Field, and later with Bell before moving on to the Glen L. Martin Company in Baltimore. His experience with variable swept wing design was crucial to the success of the Bell X-5 program.






30 M.M. CAL. MK-108 (German)
600 R.P.M. PER. MIN.
60 R.D.S. PER. GUN

Above and opposite: The Me P 1101 V1 at Bell Aircraft Corporation. Former Messerschmitt engineer, Woldemar Voigt, is shown inspecting the engine bay. Silhouettes represent the location of the proposed German armament installation of four MK 108 cannon, and six 50 cal machine guns (top) favored by the Americans.

ground. American soldiers also found parts for the Me 262 C-3, three MK 103s, some MK 108s, and a model of a MK 214 cannon in Building 615 of the Oberammergau complex.

Preparations for series production of Me P 1101 fighters were made in early 1945.[5] Four different single-seat combat aircraft were planned. The P 1101 Schönwetter-Jäger I (good weather fighter I) with reduced avionics, that only allowed operations in fair weather was to be powered by a Jumo 004B and armed with two MK 108s. It was likely that an 80 US gal (300 liters) drop-tank could be carried under the fuselage. It was suggested that the aircraft be later replaced by the P 1101 Schönwetter-Jäger II, another day fighter with a pressurized cockpit and an HeS 011 A-1 turbojet engine. Radio equipment consisted of the FuG 218, FuG 206 and FuG 500. A gyro-stabilized EZ 42 gun sight was to be fitted, and a K 15 autopilot was proposed. The most advanced German air-to-air weapons also were eligible to be carried as auxiliary items including:

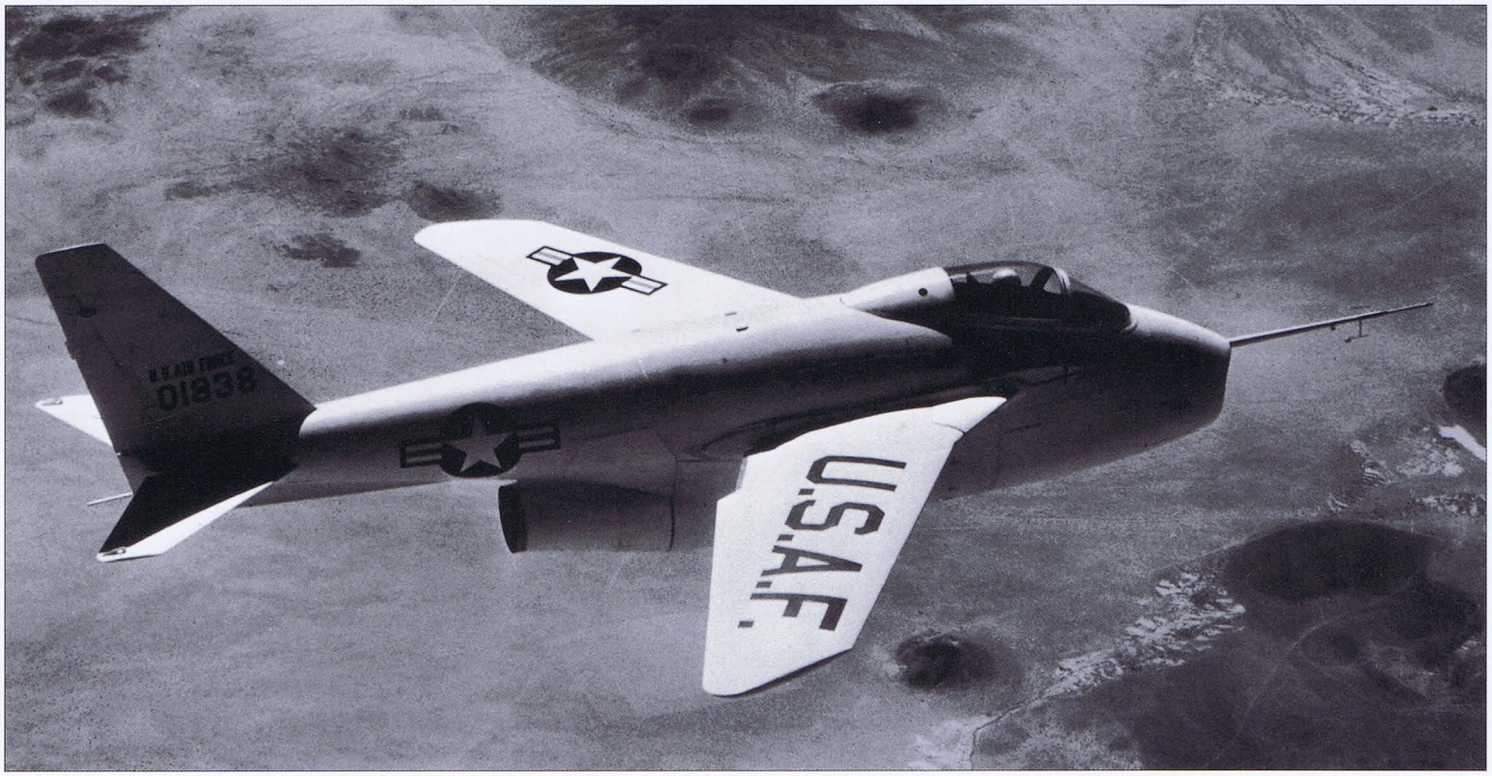
- MK 108 (100 rpg) as standard armament.
- Two Abschussgeräte AG 140 (rocket launching systems) with two Werfergranaten WGR 21 (rocket grenades) under the wings (air-to-air rocket launching equipment).
- Twelve Sondergeräte SG 116 (vertical rocket launchers).
- Eight Rohrbatterien RB 108s (salvo batteries).
- Four Kramer X 4 air-to-air missiles (Ru 344).
- Two Henschel Hs 298 air-to-air guided missiles.

The Me P 1101 Schlechtwetter-Jäger (bad weather fighter) was proposed in early 1945. It was a well-armed all-weather fighter able to attack targets in poor visibility. The single-seat fighter was to be armed with the X 4 or Hs 298 guided air-to-air missiles, or the Oberon system. Eventually, a fast interceptor version of the P 1101 powered by an HeS 011R composite power plant (an HeS 011 with an auxiliary rocket engine) was designed. It carried the same armament as the Schlechtwetter-Jäger, but was designed to attack high-flying enemy fighters and bombers with air-to-air missiles. None of the above mentioned P 1101 versions were realized.

Early in June 1945, Robert J. Woods, Bell Aircraft Corporation's chief design engineer, became interested in the aerodynamic possibilities inherent in the P 1101's variable-sweep wing, and tried to have the prototype completed in Germany under American supervision. The engine could not be located, only an HeS 011 mockup and an incomplete Jumo 004B were found. It was then decided to dismantle and ship the aircraft as is (together with a second set of wings) to Wright Field in the United States. The Me P 1101 V1 was thoroughly examined at Wright Field, the prototype was not completed. Eventually, in August 1948, after it had been declared surplus by the United States Air Force, the Me P 1101 V1 was handed over to the Bell Aircraft Corporation on the recommendation of Robert Woods. Bell had remained very interested in developing a full-fledged fighter with variable swept wings based on the P 1101 design. They even hoped to adapt the Messerschmitt prototype to take a variety of American engines, but in the end Robert Woods and his associates concluded that too much work would be required. Bell engineers therefore concluded that an entirely new aircraft, albiet based on the P 1101, would have to be built. Thus, after Bell had no further use for the Messerschmitt prototype, it was reportedly scrapped. Released from the technical problems associated with the German aircraft, Bell lost little time developing plans for a new fighter with fully adjustable swept wings. Bell had hoped to design an aircraft which would enjoy wide appeal within the Air Force, but as events unfolded this dream was not to be. Disappointed, Bell then recommended early in 1949, that a flying testbed for the variable swept wing be developed. This was accepted on July 26, 1949, and a contract for two X-5 prototypes was signed.

But prior to these events, in the Autumn of 1944, after much progress with the P 1101 had been achieved unexpected

5 Apparently the RLM never allocated an official GL/C number to the Me P 1101 since surviving records do not mention such a number. It was very unusual, though not unique for a military fighter project to advance to prototype status without an official Air Ministry designation.



problems arose. The restricted space of the weapons bay as well as the nosewheel retraction system proved troublesome. Moreover, the calculated performance envelope turned out to be lower than expected. Also, Messerschmitt engineers anticipated trimming problems. However, in spite of these challenges, Messerschmitt continued to develop the Me 262 A-1a and Me P 1106 TL-Jäger mit HeS 011 und hochgelegtem Höhenleitwerk (jet fighter with HeS 011 and T-tail), a single-seat fighter with the Me 262's wings of modified structure, with a T-tail. By December 1944, the Me P 1106's jet engine with its circular intake had been repositioned to the forward fuselage.

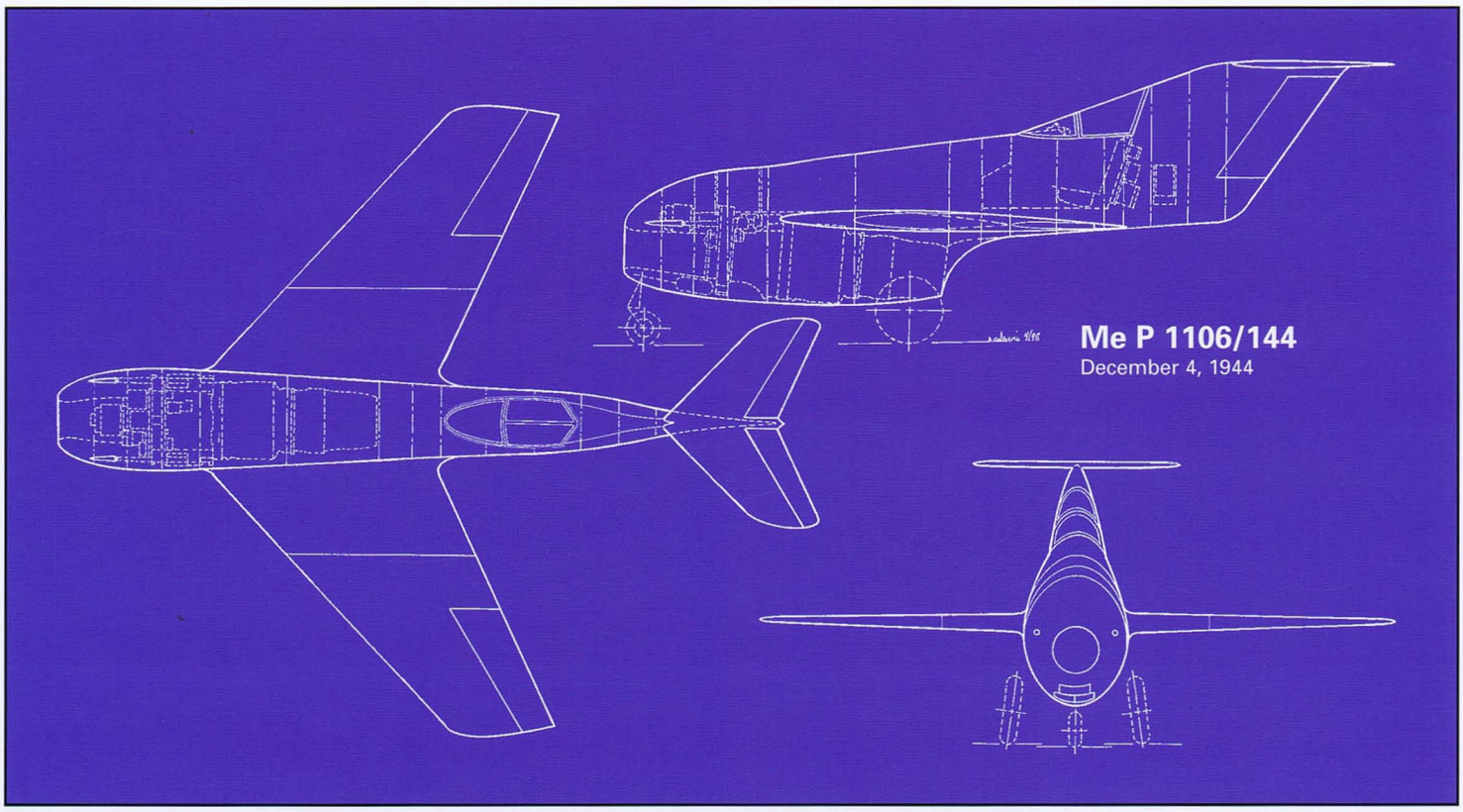
On December 14, 1944, yet another HeS 011-powered version, the Me P 1106 TL Jäger mit vergrösserter Reichweite (jet fighter with increased range) was proposed. The project was to have a wingspan of 24.3 ft. (7.40 m) and a spacious fuselage to accommodate a 555 US gallon (2,100 liters) fuel tank. In January 1945, a revised project design was issued under the designation Me P 1106 TL-Jäger mit Heinkel-TL. This was expected to achieve a top speed of 677 mph (1,090 km/h) at 19,685 ft (6,000 m) and a potential maximum altitude of 45,900 ft (14,000 m). The design called for a metal fuselage and wooden wings. Both principal Me P 1106 versions featured either a T-tail or a V-tail, intended as a distinct improvement over the Me P 1101. The design was similar, except that the pilot sat at the very rear of the fuselage behind the rear fuel tank. The pilot's former position was taken up by two MK 108s and a tricycle undercarriage. The number of MK 108s could be increased to up to five. A bomb payload of up to 1,100 lb. (500 kg) could be carried. A pressurized cabin, accommodating the pilot was located above and behind the jet engine. The pilot would have been seated almost over the jet exhaust nozzle. The visibility from the cockpit of both designs was marginal. Moreover, aerodynamic drag of the Me P 1106 was calculated to be 14 percent greater than that of the P 1110, which had begun development in early 1945. As there appeared to be no improvement over the performance of the P 1101, the project was abandoned at the end of February 1945.

Above: Bell X-5, s/n 50-1838, the first of two aircraft built, was remarkably faithful to the original German design. But, unlike the Me P 1101 V1, the X-5 pilot could change the wing sweep in flight. In this view, Bell test pilot Jean Ziegler pilots the X-5 over Edwards AFB in June 1951. Today, this X-5 forms part of the Air Force Museum's collection of significant research aircraft.

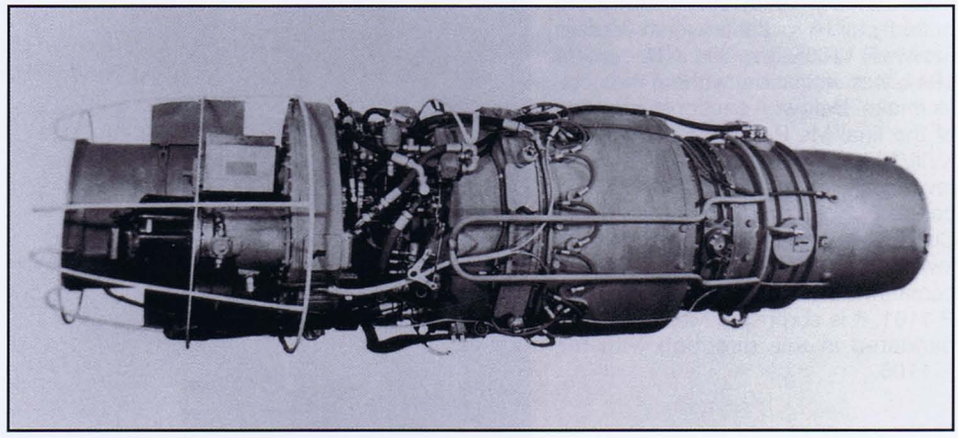
Finally, in the first weeks of 1945, a special heavily armored variant of the Me P 1106 was designed. The idea of a special Panzerflugzeug (armored aircraft) was not new. During 1944, several specially armored versions of the piston-engined Fw 190 were developed in addition to two heavily armored Panzerflugzeug models of the Me 262 (Me 262 A-3).

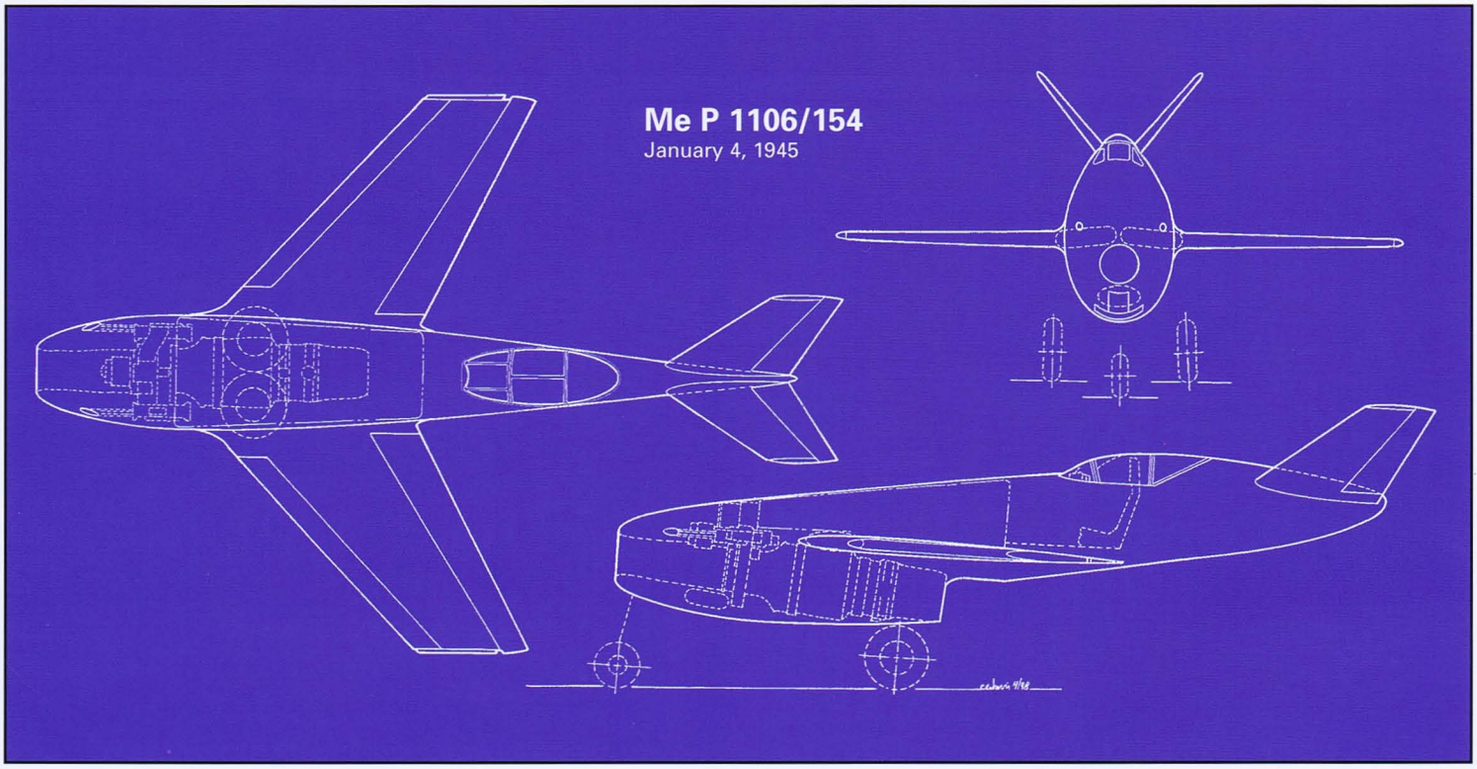
On January 12, 1945, the Me P 1110 einsitziger TL-Jäger (single-seat jet fighter) as evolved at Oberammergau. Because Hans Hornung and his team attempted to reduce the fighter's frontal diameter, difficulties with the layout of the air intake were inevitable. The drawings initially revealed a V-tailed fighter aircraft armed with three MK 108s. Several alternative designs were studied before the ultimate layout was determined. Since DVL officials concluded that air-intakes located at the sides of the fuselage would be more efficient, the P 1110 received an unusual circular air-intake located behind the cockpit. A second design modification, finished on February 2, 1945, designated Me P 1110 TL-Jäger mit Tragflügel A (jet fighter with wing A) had wing roots not unlike those of the modern McDonnell Douglas F-18 Hornet. Ten days later, a more advanced concept design known as the Me P 1110 Ente (Duck or Canard), that had canard surfaces, was proposed but not finalized due to a lack of time.

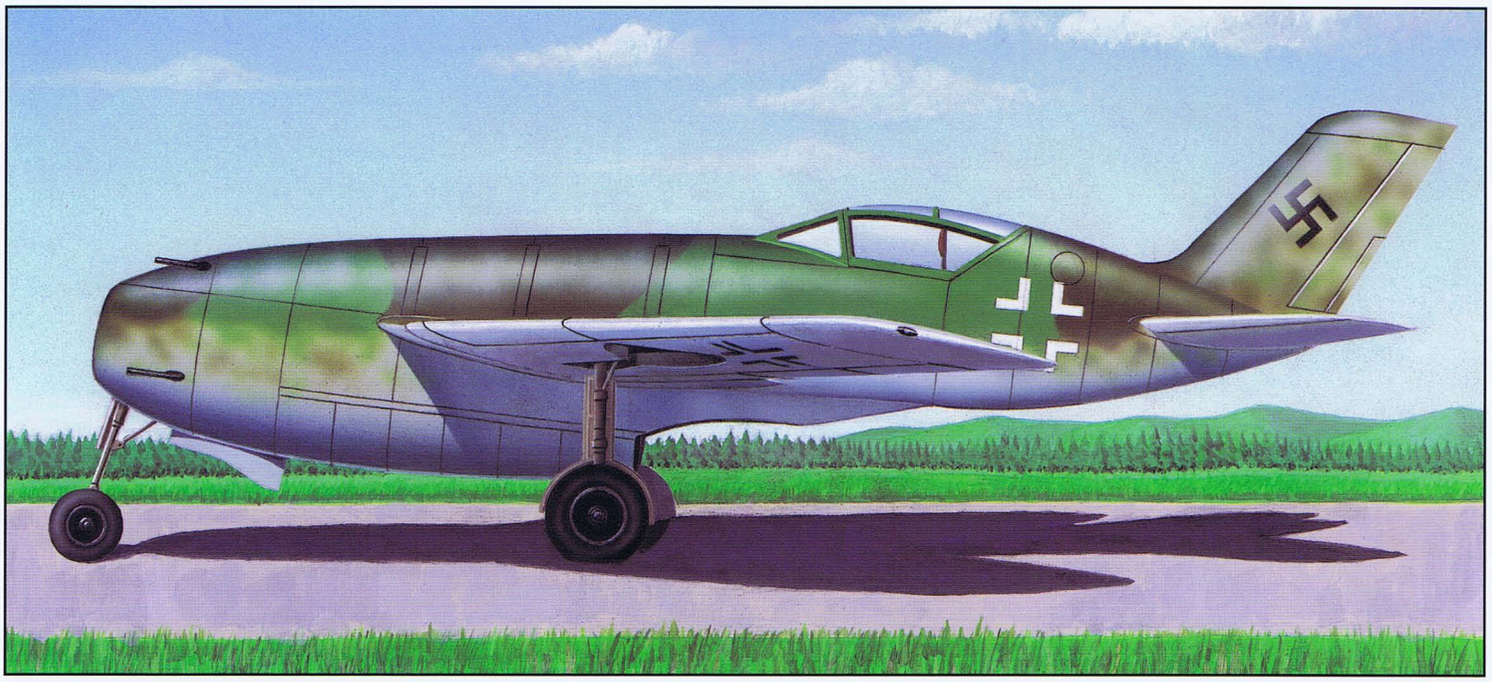
Both Me P 1110 project studies (V- and T-tail) in addition to the Me P 1111 and P 1112 focused on finding the best location for the jet engine and utilization of space, as well as optimum weapon placement and flight performance. A great deal of effort was put into creating the smallest possible frontal cross section. The undercarriage wells were taken from the P 1101. The air intakes, having a capacity of 10.5 cubic yards per second (8 cu.m./sec.), were enlarged and placed symmetrically on either side of the fuselage near the wing's uppersurface. At these air entry points, the boundary layer



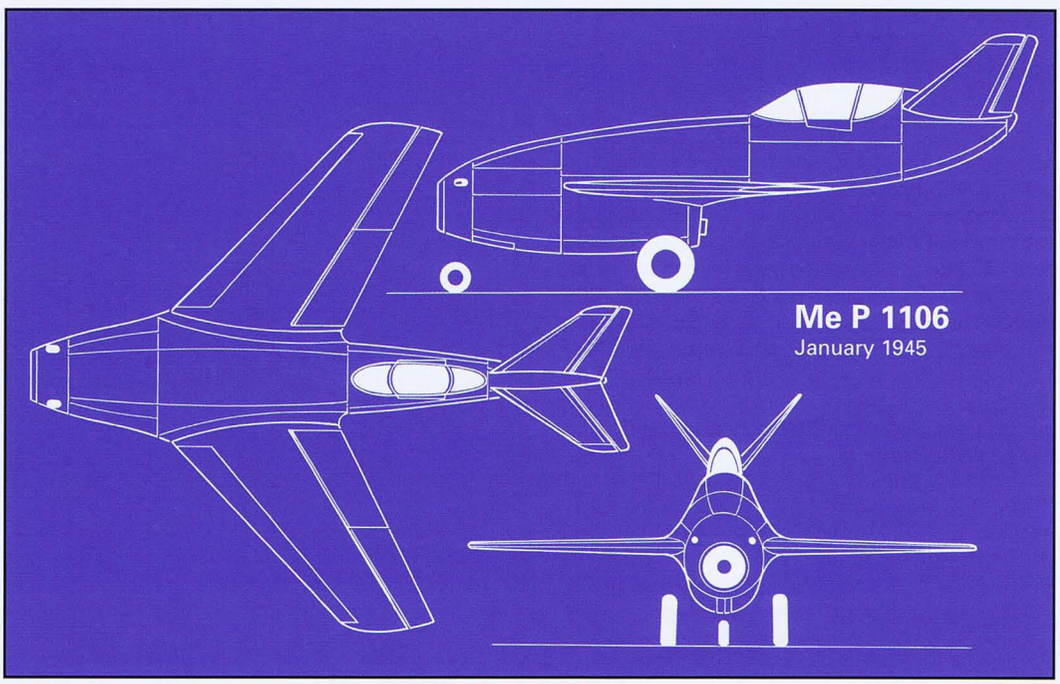
Above: The Me P 1106, from drawing XVIII/144, dated December 4, 1944, shows an unusual fighter in which the pilot was positioned in the extreme rear of the fuselage, a concept reminiscent of Messerschmitt's earlier design approach to high-speed aircraft such as the Me 209. **Right:** The HeS 011A was the intended powerplant for the P 1106. **Below:** This revised Me P 1106, from drawing XVIII/154, of January 1945, reveals a more rakish design complete with a butterfly tail. Armament remained unchanged at two MK 108 cannon.

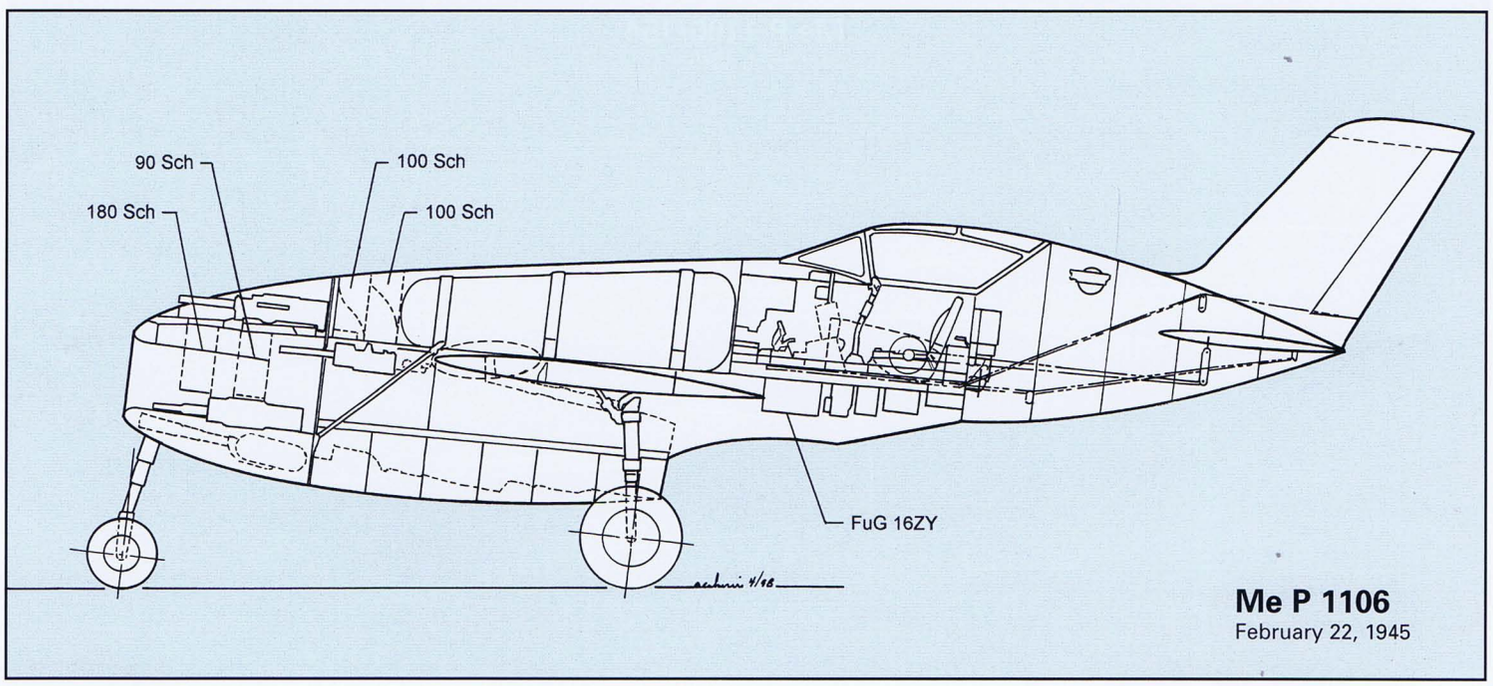




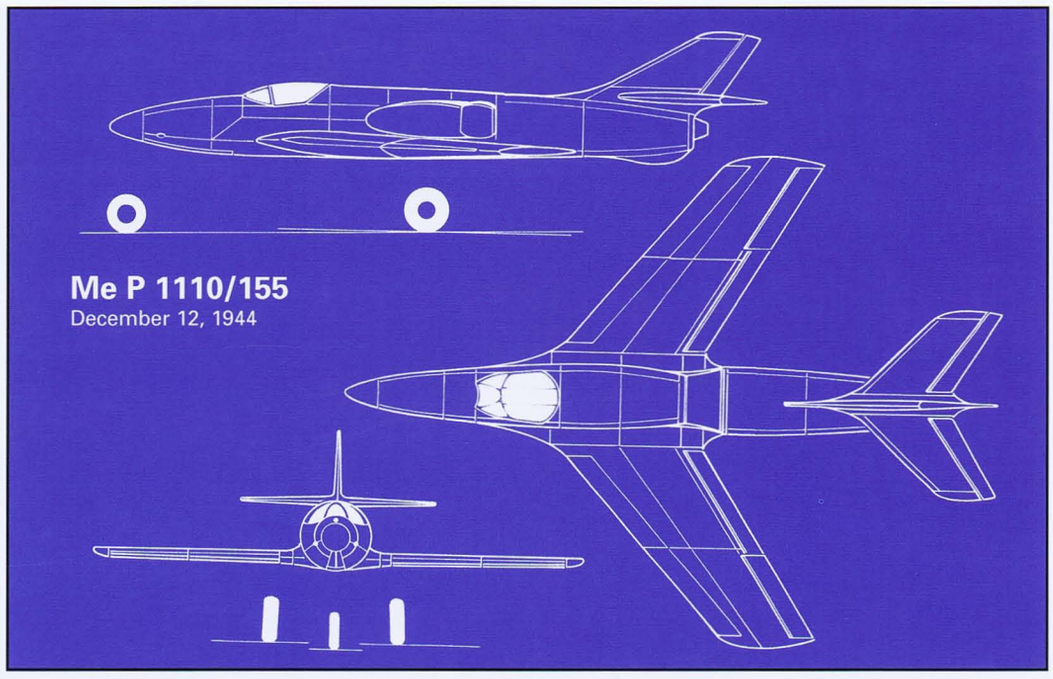


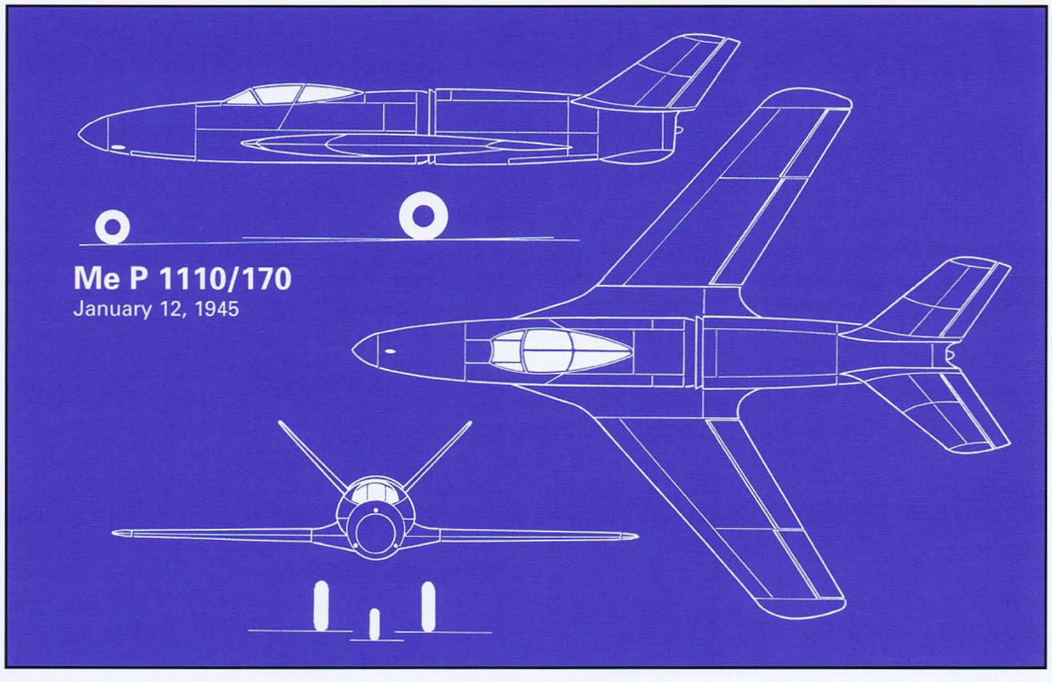
Above: Dennis Davison's impression of the Me P 1106 in its final form shows an aircraft that might be labeled a "jet powered Me 209." **Right:** This Me P 1106 version dating from January 1945, still retained the butterfly tail. A rocket powered version, the Me P 1106R, evolved in December 1944, was similar but without the nose air intake. **Below:** A sectional elevation of the final Me P 1106, from drawing XVIII/160, dated February 22, 1945, reveals an armament of four MK 108 cannon positioned in the nose. Considering the RLM's concern about low engine thrust lines resulting in constant trim changes, as in the final P 1101, it is surprising Messerschmitt persisted in this direction with the P 1106.



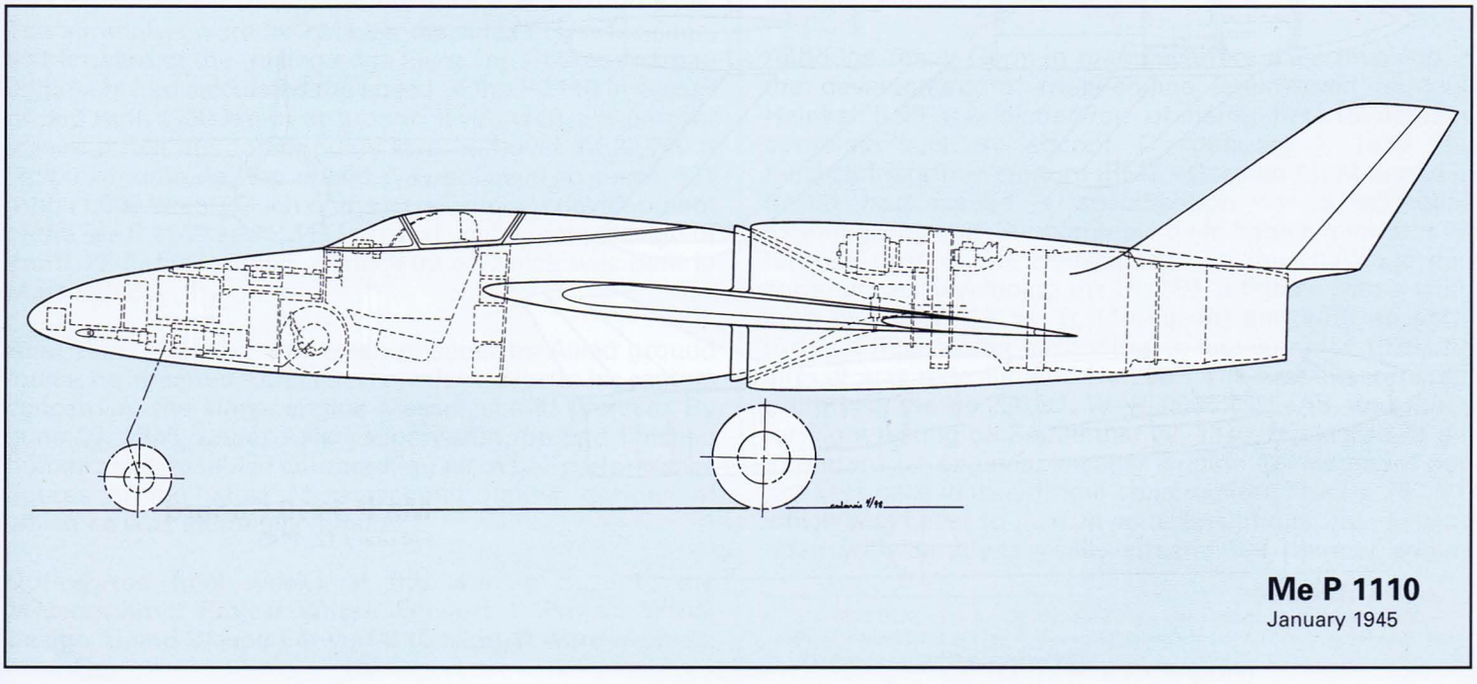


Right: The Me P 1110 from December 12, 1944, drawing XVIII/155, shows a sleek single-seat fighter of considerable potential. It was Messerschmitt's main contender in the 1944 fighter competition and featured conventional twin air intakes positioned at the mid fuselage.

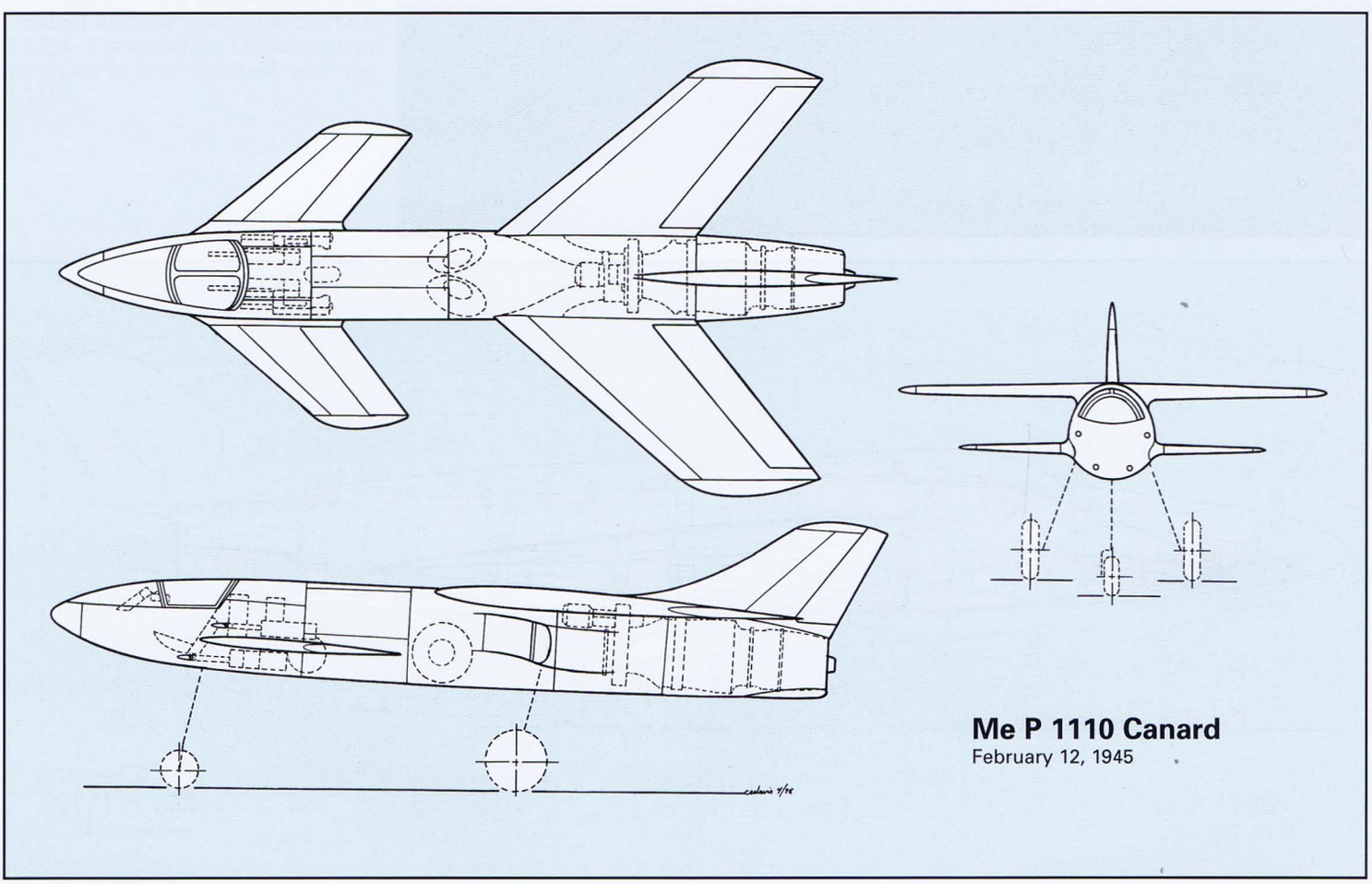




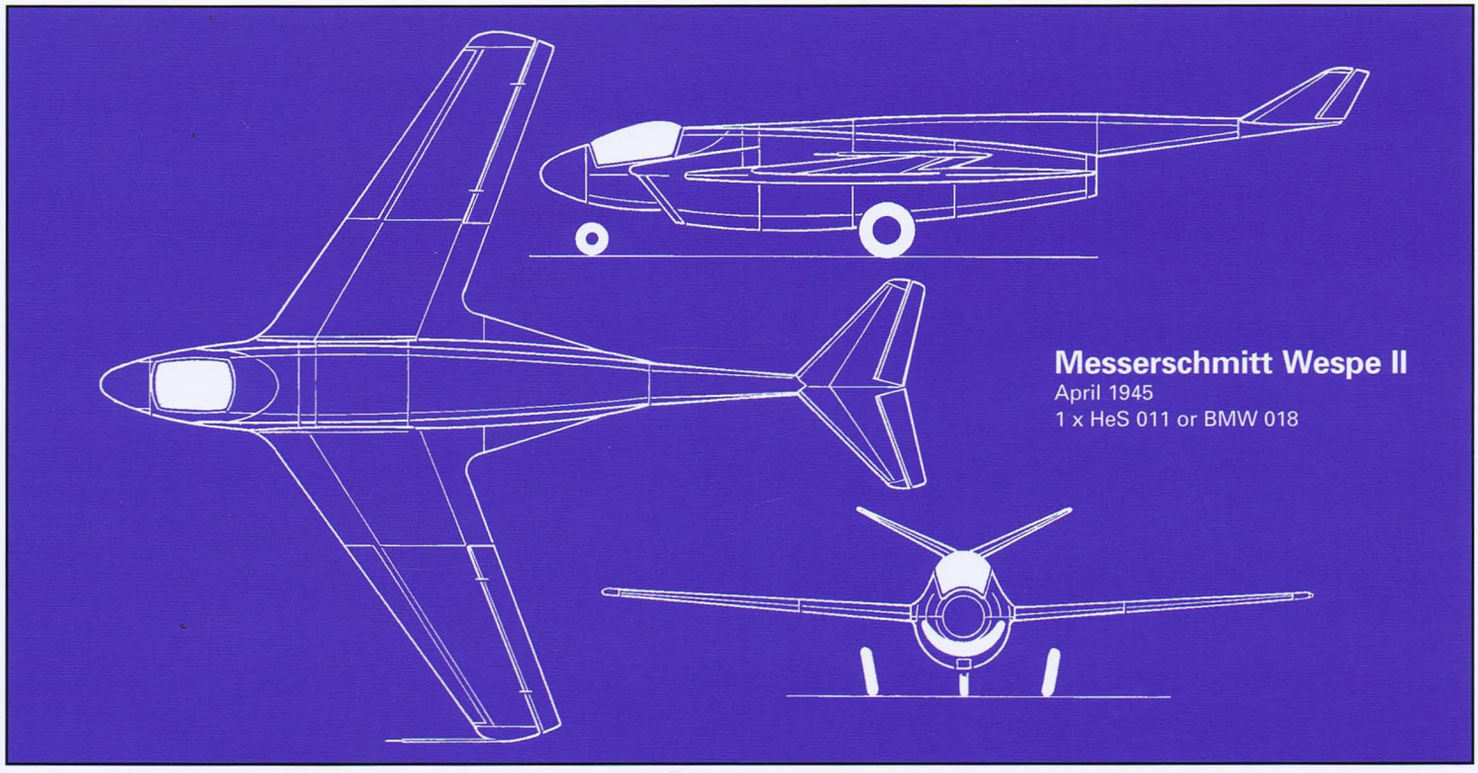
Left: The Me P 1110 from drawing XVIII/170, of January 12, 1945, displays a change to a butterfly tail and a novel circular air intake which completely surrounded the fuselage at the mid point. **Below:** This sectional view reveals the placement of the trio of 30 mm MK 108 cannon in the nose and the HeS 011 mounted in the rear fuselage.



Above: Keith Woodcock's dramatic representation of the Me P 1110 Ente (Canard) successfully captures the advanced features of this unusual fighter project. **Below:** A three-view general arrangement drawing of the Me P 1110 Canard based upon a Messerschmitt drawing dated February 12, 1945. The project was to have been powered by a HeS 011A and armed with four MK 108 cannon. An interesting feature of this design was the flush-fitting air intakes positioned mid fuselage under the wing leading edge. The main undercarriage would have retraced forward with the main wheels turning slightly to rest within the lower fuselage. The nosewheel would have retracted rearward. A special Zerstörer version, the Me P 1110 W (W - Waffen/Weapons), was evolved during March 1945 (see p. 191).



Me P 1110 Canard
February 12, 1945



Above: The Messerschmitt Wespe (Wasp) II of April 1945 was a sleek single-seat jet fighter project that was to be powered by either a Heinkel HeS 011 or BMW 018 turbojet.

velocity would reach approximately 950 feet per second (290 m/s). In the intake ducts, this air flow was reduce to 460 ft./sec. (140 m/s) with a corresponding increase in dynamic pressure. A power-driven exhaust was employed to eliminate the unwanted vortices which otherwise occurred during takeoff. This additional blower would have used about 200 hp, resulting in the P 1110 project having approximately 12 percent less thrust, but also less drag, than the Me P 1106.

The armament of three MK 108s (two with seventy and one with one hundred rounds) was to be carried in the nose immediately forward of the cockpit, which occupied the entire width of the fuselage. Two additional MK 108s could be installed as optional equipment. A large self-sealing fuel tank was located behind the pilot's cabin, followed by the HeS 011 A-1 or B-1 turbojet unit in the fighter's extreme tail. The air intakes were far back on the sides of the fuselage, just forward of the trailing edge fillet. The Oberammergau engineers had calculated the speed of the P 1110 in excess of 560 mph (900 km/h) at ground level, with a 4 percent loss of thrust due to boundary layer removal. At 22,700 ft (7,000 m) altitude, top speed was believed to reach 621 mph (1,000 km/h). Much of the data from the development of the Me P 1110 and P 1111 proved useful in the design of the P 1112, flying wing, a mock-up of which was built in March 1945.

After Hans Hornung was taken prisoner by Allied ground forces, he imparted a great deal of information to his captors concerning the single-engine Messerschmitt projects. By June 27, 1945, under Allied supervision, he had finished numerous data tables enumerating all major performance figures of the latest Messerschmitt fighter designs of which he was intimately familiar.

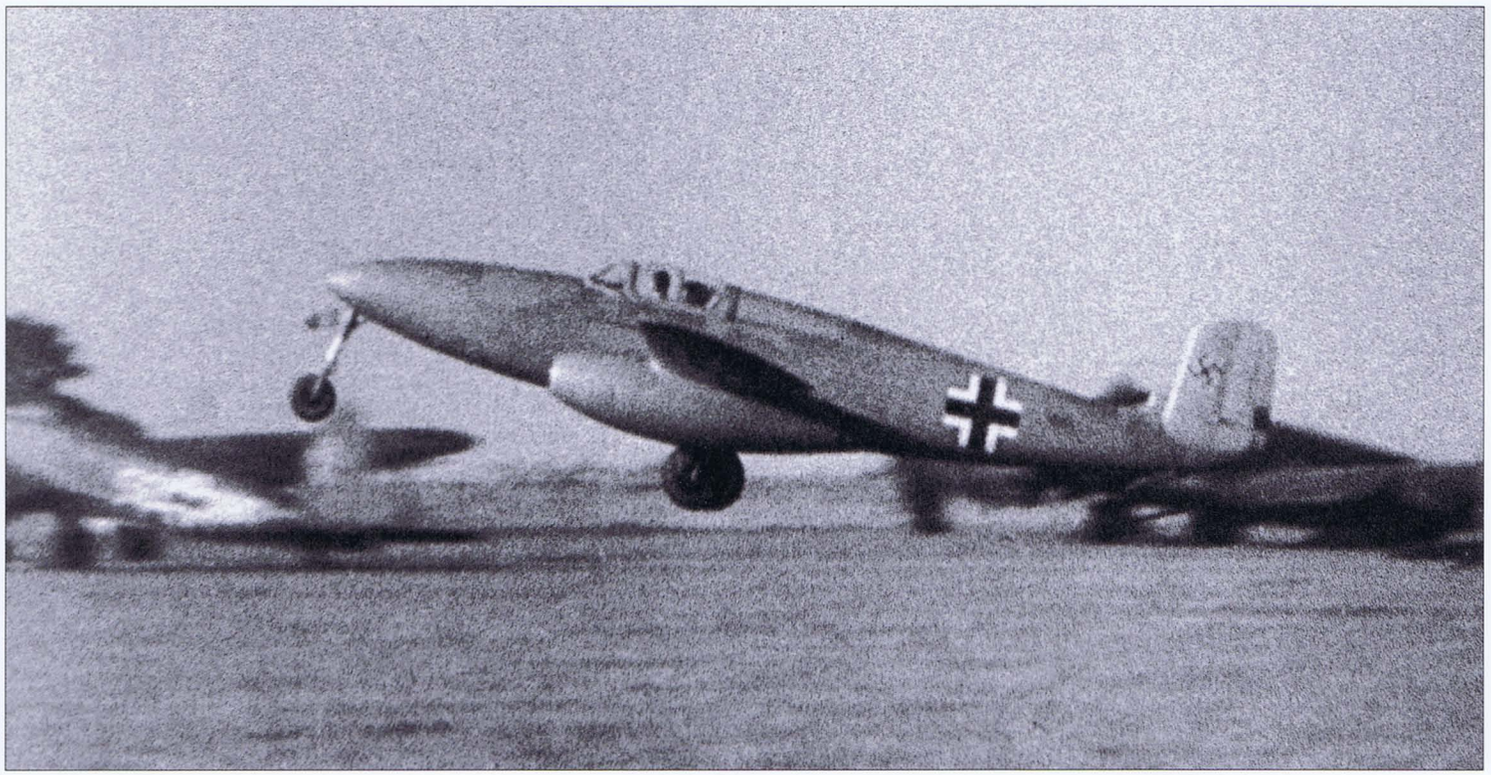
During the final weeks of the war in Europe. the Messerschmitt Projekt Wespe Entwurf 1 (Project Wasp, Design 1) and Wespe Entwurf 2 (Design 2) were evolved, but very little data has survived. Each version embodied distinct characteristics in nearly every aspect. Design concept 1 featured a prone pilot in the forward fuselage, with a Jumo 004C located aft. Air intakes were located under the cockpit section. The main undercarriage would have retracted rearward into the inner wings, while the nosewheel retracted into the front fuselage. Fuel was to be carried in two self-sealing tanks in the main fuselage, and additionally in four wing tanks. The wing was designed to have a sweepback of 31.5 degrees. The tailplane of Entwurf 1 was sharply swept back and configured as V-tail. A novel speed brake was to be provided in the rear fuselage. Unfortunately, further information on this interesting project has vanished.

Entwurf 2 was radically different. The pilot's cabin was moved to mid-fuselage. The V-tail was replaced by one with a large dihedral, similar to that of the Me P 1107. It seems that the only commonality between the two was in the wings. Only one drawing of this design has been discovered.

Multi-engine Jet Fighter Aircraft

Although many German manufacturers were involved in the development of multi-engine jet-powered fighters, Heinkel held the distinction of being first to actually complete such an aircraft. On January 4, 1939, the Reichsluftfahrtministerium (RLM – German Air Ministry) in Berlin had issued a specification for a schnelles Jagdflugzeug mit Strahlantrieb (fast fighter aircraft with turbojet propulsion). Heinkel took up the challenge and commenced developing the He 180, a fighter with a wing area of about 127 sq. ft. (16 sq. m) and with an early turbojet fitted under each wing. In late summer 1939, the aircraft was redesignated He 280.[6] The first experimental prototype, the He 280 V1, W.Nr. 00001, DL+AS, was ready for flight testing on September 22, 1940, but lacked its all-important jet engines, because engine development had not kept pace with airframe construction. The He 280 V1, which was never to receive its turbojet units, was instead fitted with aerodynamically streamlined dummy engine

6 The RLM GL/C number 180 had previously been assigned to Bücker for their Bü 180 Student, a two-seat, low-wing primary trainer. Therefore, Heinkel was advised to accept the number 280.



Above: The Heinkel He 280 V2, W.Nr. 002, GJ+CA, is shown being towed aloft prior to its maiden flight using only the power of its two HeS 001 turbojets on March 30, 1941. This prototype made a number of flights before it was re-engined with two Jumo 004s. It was destroyed during a crash landing on June 26, 1943.

nacelles for a number of unpowered test flights. The next prototype, He 280 V2, W.Nr. 00002, GJ+CA, made its first flight on March 30, 1941, powered by two Heinkel HeS 8a (HeS 001) turbojets. It was destroyed in the summer of 1943, when both turbojets failed. The He 280 V3, W.Nr. 00003, GJ+CB, was flown for the first time during the summer of 1942, and was powered by two HeS 001s. Some further experimental aircraft were built during 1943, but were never completed. Only the He 280 V7, W.Nr. 00007, NU+EB, and the V8, W.Nr. 00008, NU+EC, were flown testing V-tails and other features until the end of March 1945.

Early in September 1941, Dr. Heinkel had gone on record as optimistically stating that his new fighter would be available not later than 1942. But persistent technical problems and the loss of two prototype aircraft (V1 and V3) caused a substantial delay. Also, the available thrust of the HeS 8a (HeS 001) jet engine was much less than originally estimated. Consequently, the only other realistic option for Heinkel was to adapt his creation to the larger Jumo 004B turbojet, and in so doing, he effectively ended the likelihood the He 280 would ever enter production.

The first three Jumo-powered He 280 B-1 production fighters (He 280 V10 to V12 were the designated prototypes) were expected between April and June, 1943. They were, however, never finished, because the RLM declined permission for series production. The Jumos were simply too large to fit, and when properly installed ground clearance was reduced to a matter of inches.

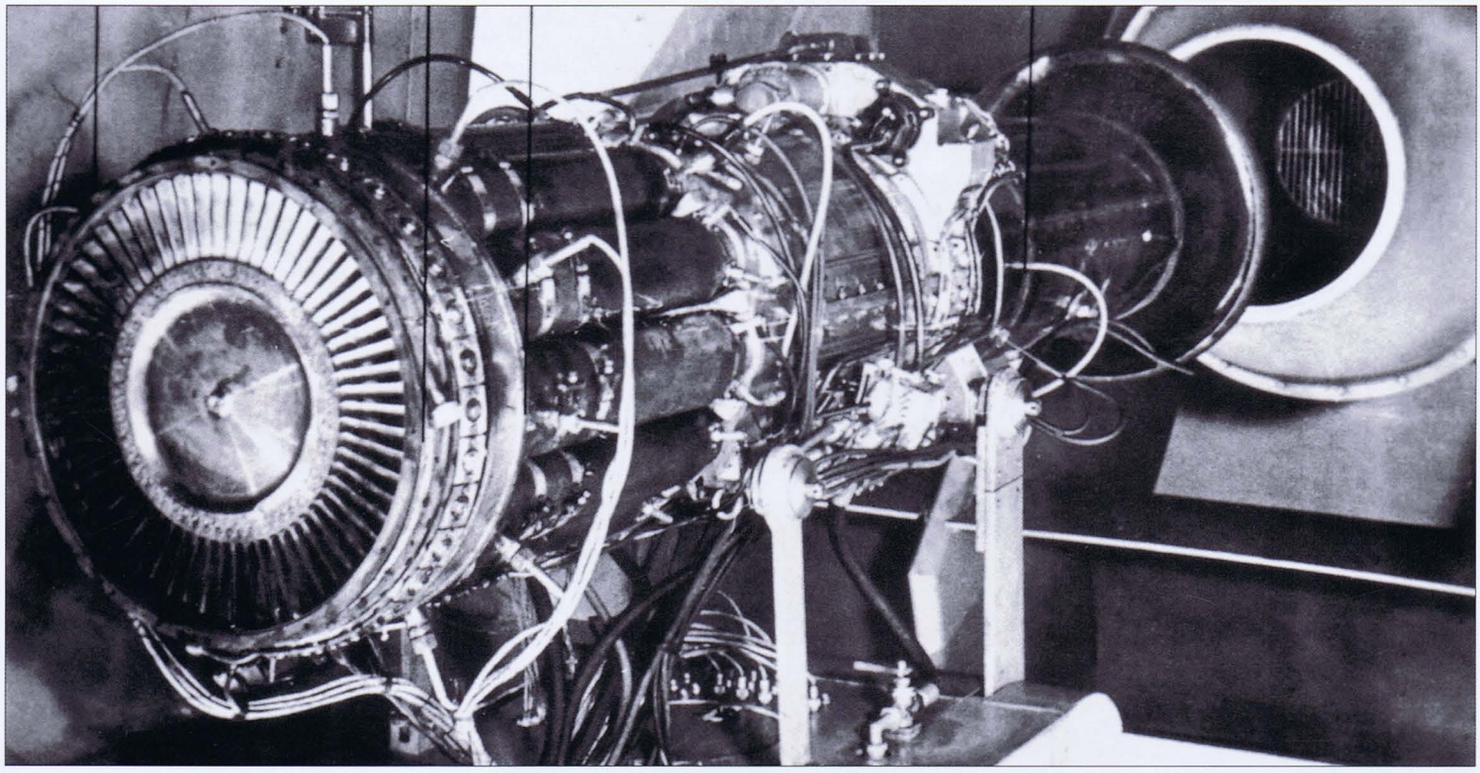
Since the RLM would only countenance continued development of the He 280 if it could be adapted to take either the BMW 003 or the Jumo 004, and since neither engine was really a viable alternative, the He 280 program was canceled in March 1943 in favor of the Me 262.

Trying to cover as much ground as possible, Messerschmitt proposed yet another jet project study, the Me P 1070, which had smaller dimensions and was armed with two 20mm cannons. This single-seat project had a wingspan of 29.9 ft. (8,20 m), a length of 26.3 ft. (8,00 m), and a height of 9.5 ft (2,9 m). Two early turbojets were to be located in an underslung position. Due to the project's conservative performance estimate, work on the project was canceled in order to accelerate development of the Me P 65.

Within a short time, the Me P 65 project was redesigned as the Me P 1065 Verfolgungsjäger (pursuit fighter), which ultimately became known as the Me 262. At the end of December 1943, evaluation of the promising Me 262 began. Without having been fully tested, and despite several unresolved significant airframe and engine problems, series production was officially sanctioned.

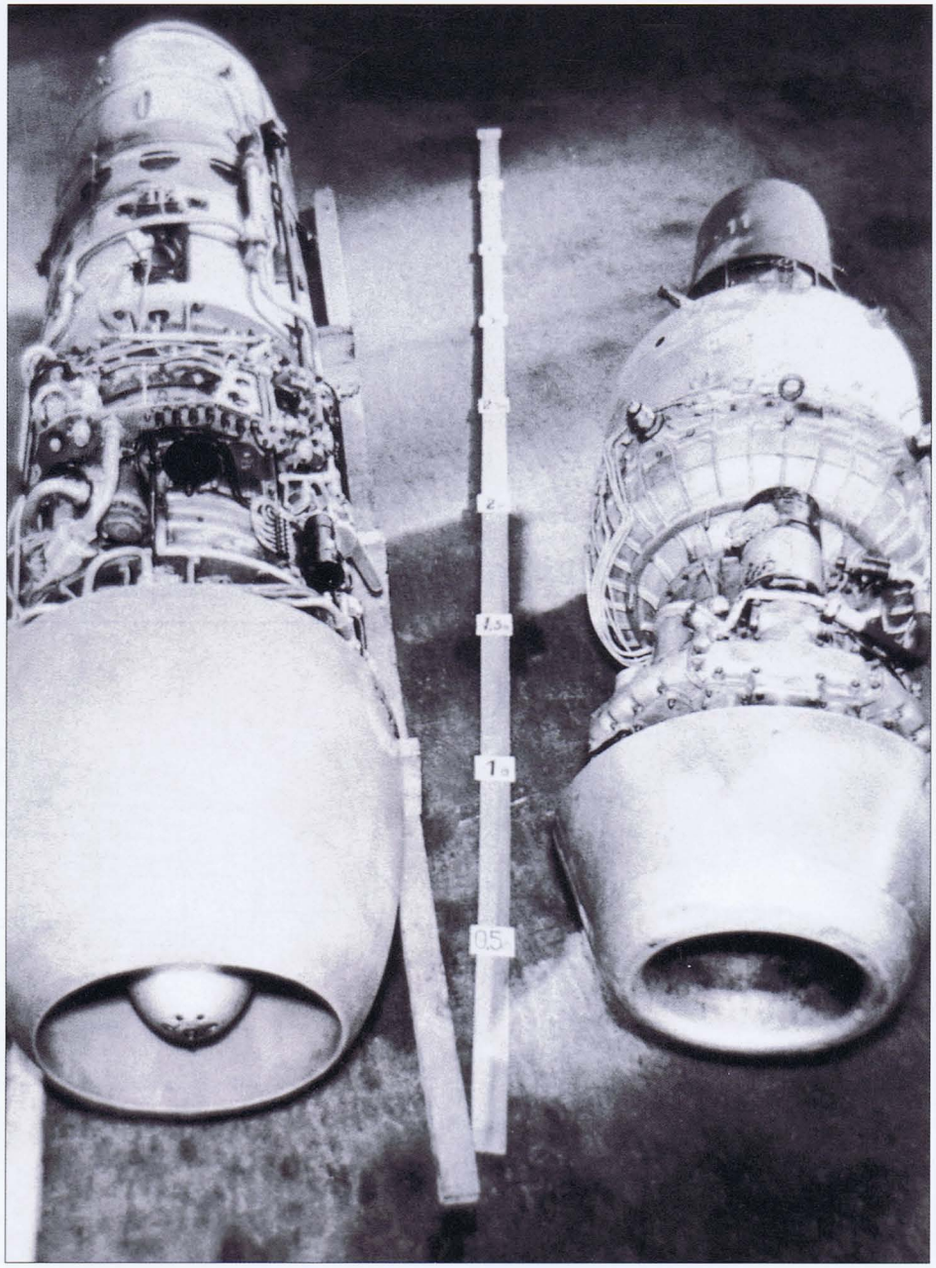
The vast majority of operational Me 262 fighters and fighter-bombers were assigned to Jagdgeschwader 7(JG – Fighter Wing 7) "Nowotny", and in 1944 to Adolf Galland's Jagdverband 44 (Fighter Unit 44), to KG 51, and to the Kampfgeschwader (Jagd) (bomber wings converting to fighter aircraft) KG(J)s 27, 30, and 54. Series production was hindered by many factors not the least of which were Allied air raids on production centers and factories supplying critical parts. Despite these circumstances, orders were issued by the RLM to increase the monthly production to 1,000 Me 262s. In March 1945, Me 262 production broke down completely, due in no small part to heavy Allied attacks on production sites that had been previously evacuated into forests and other seemingly secure locations. Similarly, a significant number of Jumo turbojets failed to reach their destinations at the new assembly sites in southern Germany. Despite the dire situation in Germany, Adolf Hitler ordered the destruction of all important facilities before German troops were forced to withdraw.

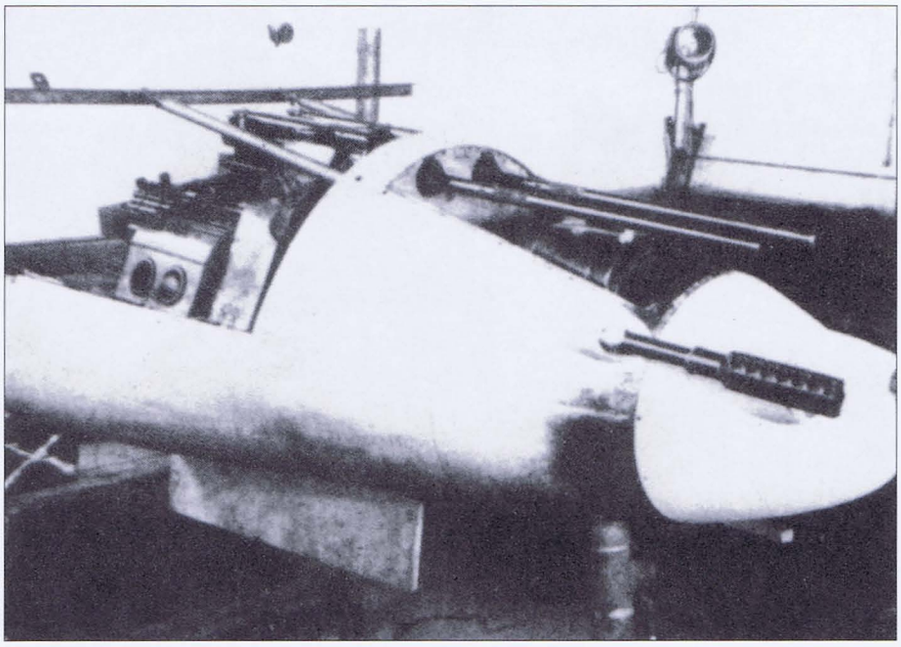
Development of the Me 262 continued at Lechfeld, near Augsburg in Bavaria as late as April 1945. Test installations were carried out with the K22 autopilot, the FuG 125 radio, and the gyro-stabilized EZ 42 Adler (Eagle) gunsight to name a few. At the same time further important modifications



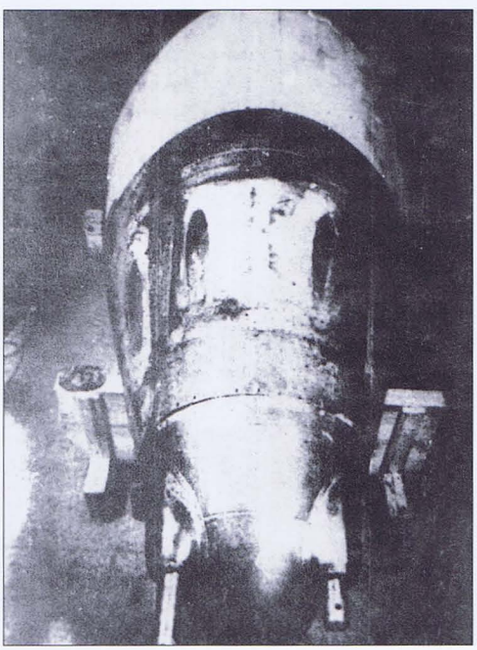
Above: A rear view of one of the three prototypes of the Heinkel HeS 30. This 5-stage axial flow gas turbine utilized 10 combustion chambers and one turbine stage (shown). Development of this engine began in 1941 and was tested in April 1942. Bearing the Air Ministry designation HeS 006, this 860 lb (390 kg) turbojet, designed by Dr. Max-Adolf Müller, measured 9.3 ft (2850 mm) in length, 1.8 ft (562 mm) in diameter, and generated 1,645 lb (750 kg) of static thrust. In spite of the fact that this promising engine, designed to produce 2,205 lb (1,000 kg) static thrust, had a very favorable power-to-weight ratio, it failed to impress the RLM.

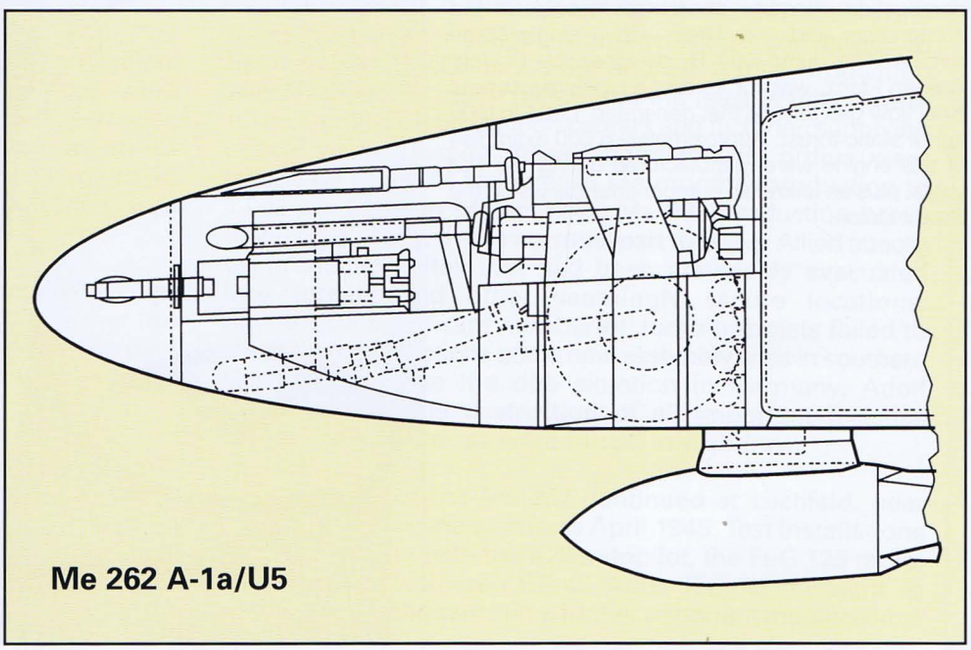
Right: A comparative view of the Junkers Jumo 004 B-1 and the smaller HeS 8a (HeS 001). The HeS 001, designed by Dr. Hans Joachim von Ohain, was a centrifugal gas turbine that developed 1,587 lb (720 kg) static thrust and powered the He 280 V2 shown opposite. Before it was abandoned in 1943, some 30 examples had been manufactured. The HeS 001 measured 5.5 ft (1675 mm) in length, 2.5 ft (775 mm) diameter and weighed 850 lb (386 kg). It featured an annular combustion chamber positioned in back of the compressor and was fitted with a single stage turbine. The Jumo 004 B, designed by Dr. Ing. Anselm Franz, was for its day, a highly successful axial flow gas turbine that generated 1,984 lb (900 kg) of static thrust. Approximately 6,000 examples of this engine were manufactured during the war years, plus an unknown number after the war in the Soviet Union.

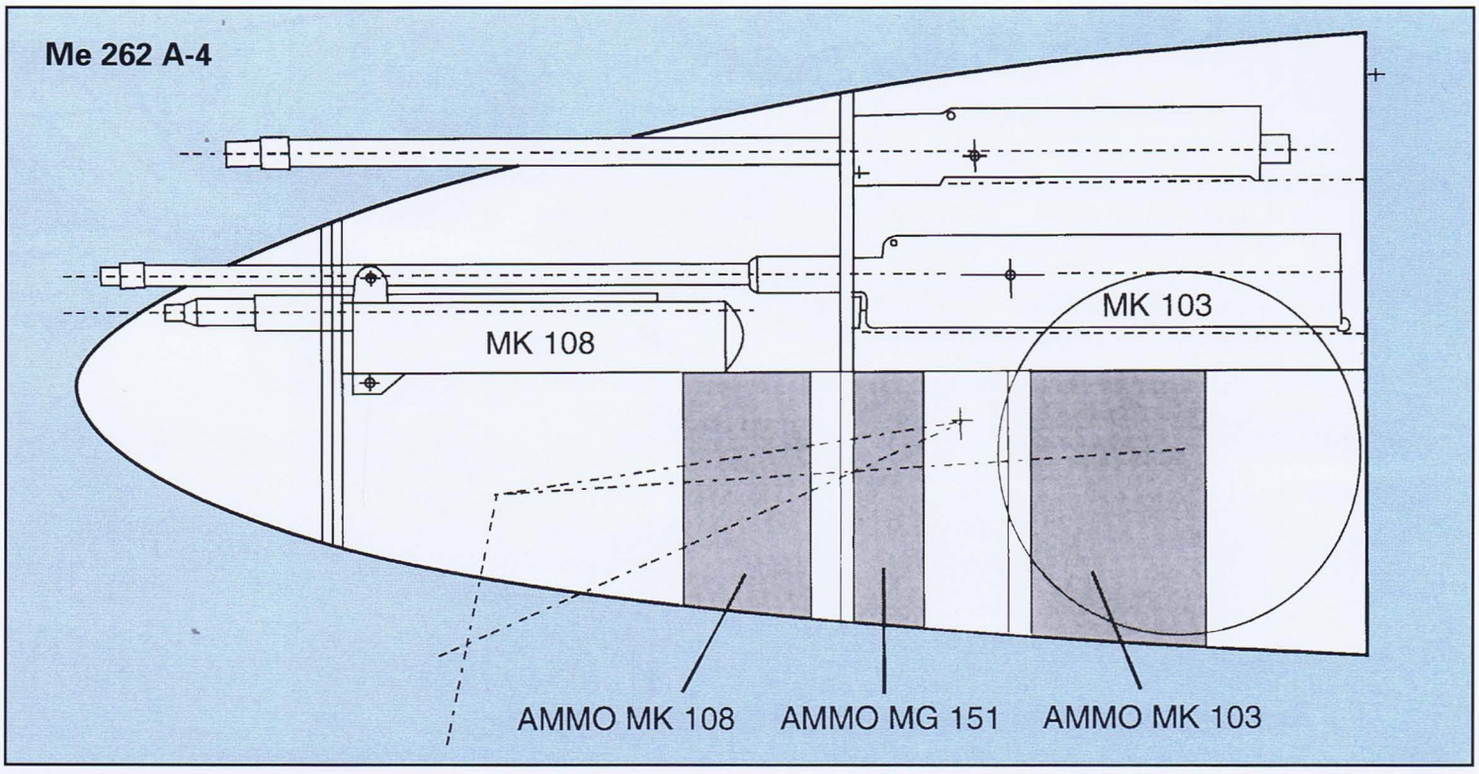




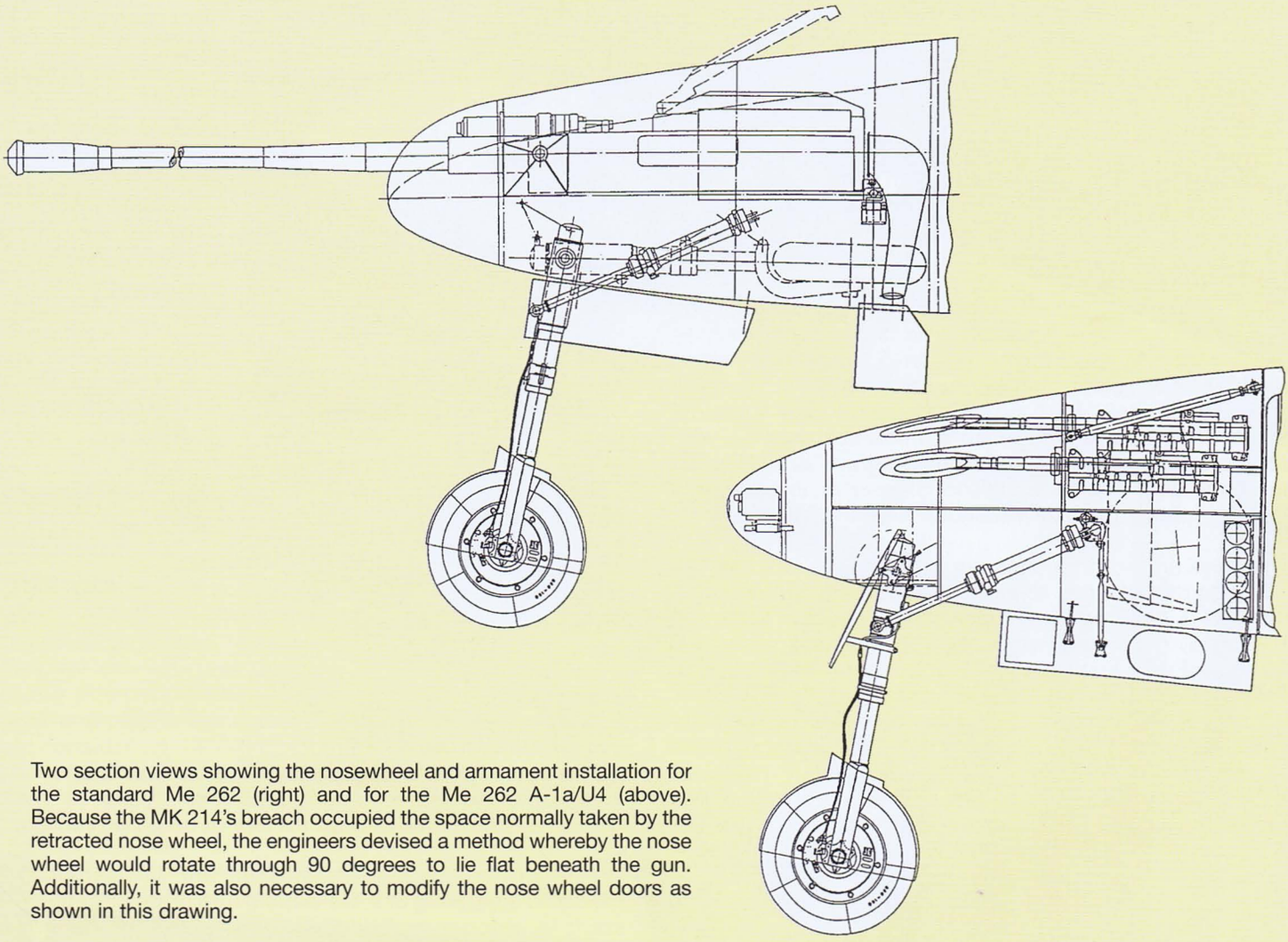
Left: Most Me 262's had a standard armament of four MK 108 cannon, but a number of modification construction sets (Umrüst-Bausätze) were developed to vary this potent weaponry. The Me 262 A-1a/U1 was to include two MG 151/20s (top) plus two MK 103s (lower). **Below:** This Me 262 A-1a/U4 (also known as the second Me 262 V4), W.Nr. 170083, carried the huge 50 mm MK 214. The name "Wilma Jeanne" was applied by Americans following capture. **Bottom:** The Me 262 A-1a/U5 would have been equipped with six MK 108 cannon.



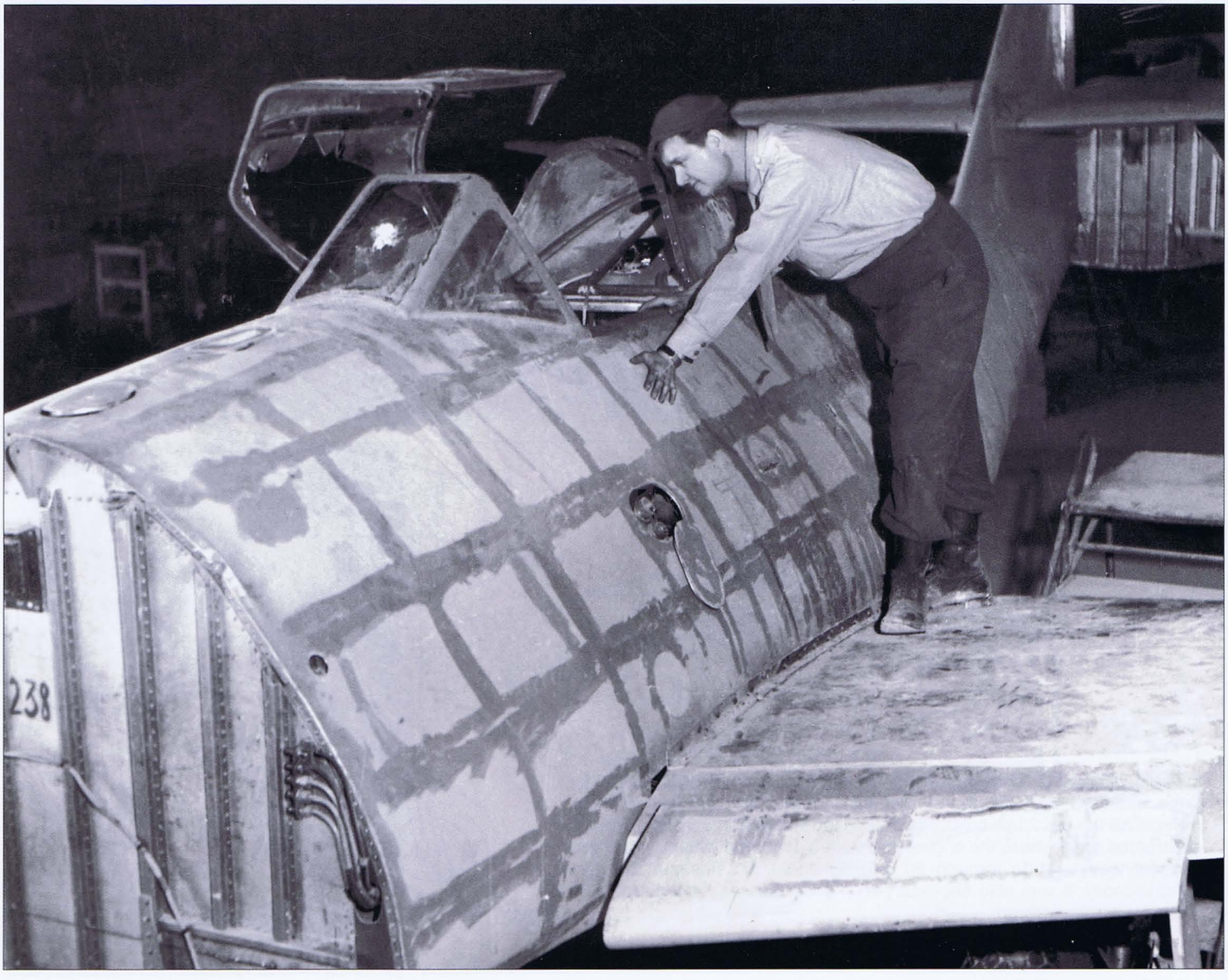




Above: The Me 262 A-4a series was initially designed to house a total of six cannon which included two 20 mm MG 151/20 (top) with 176 rounds, two 30 mm MK 103 (middle) with 72 rounds and two 30 mm MK 108 (bottom) with 66 rounds. This version was never built. Instead, the A-4 series became associated with an unarmed photo reconnaissance version based upon the Me 262 A-1a/U3. In this version two obliquely mounted Rb 50/30 cameras mounted in the nose section replaced weapons.



Two section views showing the nosewheel and armament installation for the standard Me 262 (right) and for the Me 262 A-1a/U4 (above). Because the MK 214's breach occupied the space normally taken by the retracted nose wheel, the engineers devised a method whereby the nose wheel would rotate through 90 degrees to lie flat beneath the gun. Additionally, it was also necessary to modify the nose wheel doors as shown in this drawing.


238

Left opposite top: Many incomplete Me 262s were found by American troops at an outside assembly site at Obertraubling. **Opposite lower:** Other incomplete Me 262s were found in the tunnels of the underground facility at Kahla (see p. 7). **Above:** The Me 262 V167, W.Nr. 130167, became the second Me 262 V5.

were under study including a high-speed test aircraft, as well as the installation of the BMW 003, HeS 011, and Jumo 004C turbojets, a fully pressurized cockpit, oblique upward-firing armament, improved armor protection, and many other important modifications.

Apart from the standard forward-firing armament of four 30 mm MK 108 cannon found on the fighter variant of the Me 262 A-1a, there were alternative modifications. By the end of January 1945, the first full-scale mock-ups were finished. Then, on February 9, 1945, the Rüstungsstab (Armament Commission) decided to build two further prototypes with a new weapons bay, one containing no less than six MK 108s (Me 262 A-1a/U5), the other a combination of either two 30 mm MK 108s or MK 103s of the same caliber, and two 20 mm MG 151/20s (Me 262 A-1a/U1). Despite all efforts and Adolf Hitler's repeated insistence, it proved impossible to introduce these armament versions before the end of the war.

On March 24, 1945, with less than 45 days to the end of the war, the Führer changed his mind, and insisted upon an increased output of Me 262 fighters by all means possible: Adolf Hitler's Führerbefehl (leader's decree) was issued. Now, the installation of six MK 103s or four 37 mm BK 3,7 (Flak 18) cannon[7] was directed. Due to Allied air attacks during this period, only 256 of the planned 450 Me 262s were completed. Even this figure represented no mean feat considering the Allies' attention to principal suppliers. After an air raid hit the primary undercarriage manufacturing plant in early April 1945, insurmountable production obstacles could no longer be rationalized.

Simultaneously, the installation of three or four heavy rapid-fire 20 and 30 mm Mauser MK 213 guns were proposed but never produced. By 1945, less than a dozen of these sensational revolver cannon were actually completed. Despite the efforts of Luftwaffe General Diesing and Mauser Director Kehrl, there was too little time remaining in the war to implement these ambitious plans. Meanwhile, SS-Obergruppenführer (SS General) Kammler tried to organize construction of partial underground production facilities protected by strong concrete ceilings, in order to safeguard the entire jet fighter production and assembly program. He also attempted to accelerate the installation of modern air-to-air rockets, especially the X 4 and R4M projectiles. Since November 1943, with the help of specialists such as Oberst Siegfried Knemeyer, Entwicklungschef TLR (Chief of development), the Luftwaffe valiantly tried to increase fire density of these missiles, together with improving range and accuracy. In addition to missiles, other large caliber weapons were evaluated including the 30 mm MK 112 and the 50 mm MK 214 aircraft cannon.

At that time, the first prototype Pulkzerstörer (Pulk = large aircraft formation, Zerstörer = destroyer) Me 262 A-1a/U4 (Werk-Nr. 111899) was undergoing tests, fitted with the Mauser MK 214 cannon. During April 1945, Major Herget attacked an Allied bomber using the MK 214 of his Me 262 A-1a/U4, but without success. All attempts to put the Pulkzerstörer in production failed as only one additional Me 262 A-1a/U4 (W.Nr. 170083) was completed.

With so many new weapons appearing on the scene, the development of advanced gunsights with which to accurately fire these weapons was a high priority. The EZ 42[8] Adler gyroscopic gunsight, developed by Askania, proved difficult to perfect. A limited number were produced for installation in test aircraft, such as the Bf 109 K-4, Fw 190 D-12, and the Me 262 A-1. Askania's attempts to push the sight to an acceptable state of reliability failed and few were actually delivered. In February 1945, production centers for the new sights were heavily damaged or destroyed by Allied bombing. The Chef TLR was thus forced to evacuate the remaining material to Hirschberg where they hoped to resume production. Without considering the course of the

7 The BK 3,7 was a potent weapon. Two of these cannon fitted on the Ju 87 G-series Stuka proved very effective against Soviet armor on the Eastern Front.
8 EZ - Einheitszielvorrichtung / Standard sighting device.

Above: Messerschmitt test pilot, Flugkapitän Karl Baur, prepares to test the EZ 42 gyroscopic gunsight mounted in Me 262 V167 during February 1945. This gunsight's development proved both difficult and frustrating. Relatively few were fitted to service aircraft before the end of the war.

war, plans were made to replace the EZ 42 by the more advanced EZ 45. Construction of a prototype EZ 45 was completed by March 30, 1945. But officers in charge on the staff of the Chef TLR knew that the planned output of the Adler gun sight would be impossible to obtain, only about fifty units were successfully assembled under the most difficult conditions. Nevertheless, by the end of March 1945, some 350 Adler gunsights were supplied. In order to increase the effective firing range of advanced aircraft armament, two distinct lines of approach had been chosen by the end of the Second World War. The first was the adoption of automatic cannons, with suitably improved aiming and sighting devices, that is, automatic gun sights which computed the angle of lead, precise range measurement, and above all the stabilization of the aircraft by special devices in order to increase aiming accuracy. The principal disadvantage, however, was the shell's limited range due to its low muzzle velocity. Ultimately these weapons proved to be unsuccessful and were generally ineffectual in high speed aircraft.

The second line of research was into a weapon system dedicated to downing enemy bombers by air-to-air missiles. Missiles such as the R4M, X 4, R 100, and Hs 298 were developed to function just like anti-aircraft shells. The rocket projectile was designed to explode after having traveled a predetermined distance, and in doing so eject a large number of fragments meant to hit the target.

At the end of February 1945, the Chef TLR, General Diesing and the Rüstungsstab ordered LGW at Hakenfelde to greatly increase the output of R4M[9] air-to-air projectiles. Oberleutnant (Lieutenant) Wegmann of 11./JG 7 had dramatically demonstrated the effectiveness of the R4M missiles on March 19, 1945. As a consequence, Adolf Hitler ordered the Me 262s of KG 51 and all other units to be equipped with the R4M rocket. However, start-up time was such that the new factories were not expected to actually commence production before mid-April.

An improved launching rack carrying forty-eight R4M rockets under the wings of the Me 262 was under construction in early April 1945. At that time, Reichsmarschall Hermann Göring tried to accelerate the output of the launchers and demanded an R4M with an increased range within the next few months. The war ended before the improved system became available. The development of an automatic firing device for the R4M was undertaken to permit continuous firing of twenty-four or forty-eight rounds with only a minimum delay between each missile launch. The rockets were to be fed to the launcher by means of a disintegrating belt. Range trials demonstrated an astonishing firing capacity of three hundred to four hundred launches per minute.

Additional remote-controlled armament would have extended the Luftwaffe's operational capabilities. this was particularly true of the X 4 (Ru 344), an air-launched winged rocket projectile for use against heavy bombers, manufactured and developed by Ruhrstahl Presswerke at Bielefeld.

After launching, the X 4 was connected to the parent aircraft by two very thin spooled wires, each about 18,000 ft (5,500 m) long. Changes in the missile trajectory could thus be manually adjusted by an operator observing a burning flare contained in the rocket's tail. The X 4 carried a 44 lb. (20 kg) warhead capable of destroying a four-engined bomber within a range of approximately 50 ft (16 m) by means of a proximity fuse. Tests were carried out at Dachauer Moos, near Munich, and Peenemünde-Karlshagen, as well as by members of Versuchskommando Nord (Test Detachment North).

After some fifty test launches from various Fw 190 F-8s and a Ju 88 S-1, it became clear that a faster aircraft was needed to continue testing. Between August and December 1944, a total of eighty-four test launches had been carried out. On December 11, 1944, the OKL directed that the new

9 R4M – Rakete, 4 kg, Minen Geschoss

Above: This incomplete Me 262 A-1a, W.Nr. 501228, photographed on May 25, 1945, at Obertraubling, is fitted with an enlarged rudder trim tab and pilot shoulder and head armor. These features were relatively rare in most production Me 262s.

weapon be given high priority. It was proposed to fit two missiles under each wing of the Me 262 A-1a. Even though most of the tests appeared successful, the X 4 was never used operationally, primarily because of the inherent danger posed by the missile's liquid-fuel propulsion system. As a remedy, a solid-fuel rocket unit was under development being a much safer and more practical propulsion system, but little was accomplished before the war's end. Besides the X 4, another remote-controlled air-to-air weapon, the R 100[10] was also under development. Three different types were envisioned.

The first was the R 100 BS Brandsplitter (incendiary shrapnel), which was filled with several hundred incendiary pellets, small projectiles intended to puncture and set fire to fuel tanks of enemy aircraft. The second was an R 100 containing small HE (High Explosive) charges, each fitted with an impact fuse. The third type featured automatic proximity fuses working on an optical-electrical principle. All three R 100 versions were primarily intended for use against the Allied four-engine bomber formations over the Reich. On March 28, 1945, the first modified Me 262 assigned to fire the R 100 was completed. This test aircraft was able to carry a redesigned R 100 BS, later designated R 100 DS, which could be fired with the help of the Oberon device. Early in April, 1945, the first Me 262 A-1a, W.Nr. 111994, allotted for this purpose was under construction.

In 1945, the introduction of another air-to-air weapon, the Hs 298 missile, was being prepared. It had been under development by Professor Wagner of Henschel since 1941, but never reached operational status. Attempts to fit this missile with a reliable automatic aiming system failed. Its first test firing took place on December 22, 1944, from a modified Ju 88, which carried three He 298s. On February 6, 1945, after about 450 missiles had been completed, production was halted.

10 R100 – Rakete, 100 kg

This was followed by plans to install still more powerful weapons able to reach a rate of fire of 15,000 rounds per minute. For example, the Rohrblock (barrel block) SG 118, a 30 mm weapon consisting of seven clustered MK 108 barrels, as well as other Sondergeräte (such as the SG 119 Rohrbatterie – barrel battery) were developed from 1944 onward but they were never used operationally.

It was not only aircraft armament which was important for the further development of the Me 262. From February 16, 1944, three steps were taken to introduce a high-speed version of Germany's standard jet fighter. The Me 262 high speed program encompassed three solutions including the Me 262 HG I, Me 262 HG II and Me HG III (HG-Hochgeschwindigkeits-Jäger (high-speed fighters), of which the first flyable aircraft were under construction early in 1944. At the end of March 1944, the Projektbüro at Oberammergau pushed ahead with plans to rapidly complete the Me 262 HG I, by using the Me 262 V9 (9th Me 262 prototype) for flight evaluation. It was modified with a low-drag cabin hood referred to as the Rennkabine (racing cabin) a new triangular addition to the inboard leading edge of the wing and a new horizontal tailplane with a 40-degree sweptback and a slight modification to the leading edge of the fin which slightly increased its area. By March 31, 1945, a total of 201 flights had been made by the Me 262 V9 some in conjunction with the HG I program. At this period, after sufficient information had been acquired with the Rennkabine, the aircraft once again reverted to a conventional tailplane.

The Me 262 HG II proposal was compiled between April and December 1944. In addition to new triangular fillets at the wing leading edges, a tailplane with a sweepback of 40 degrees and a modified streamlined canopy Rennkabine II were proposed. Additionally, tests with unmanned gliders were carried out to investigate and improve the design of the 35 degrees sweptback wing. Concurrently, a wind tunnel model and a full-scale mock-up were built. The first HG II (Werk-Nr. 111538) was still under construction at Lechfeld in April, 1945.

The HG III was the most radical design and differed from the HG II by its 45 degrees sweptback wings and two HeS 011As buried in the streamlined wing roots. The design underwent some modification as the program progressed, which resulted in a changed wing plan with larger and more direct engine intake cutouts. Wind tunnel tests proved that drag was reduced, thanks to the clean aerodynamic layout. The Oberbayerische Forschungsanstalt stated that the performance of the Me 262 HG III fighter would match that of the single-engine Me P 1106 project.

Attacking heavily defended Allied bomber formations in 1944 was a high risk proposition. To help ensure pilot survival, two well-armored aircraft known as the Me 262 Panzerflugzeug I and Panzerflugzeug II were advanced. The proposed bomber destroyer variant Me 262 A-3a, based on the heavily armored fighter designs, provided protection for the pilot as well as for ammunition, fuel tanks, and air intakes. Two comprehensive descriptions of the aircraft were issued on March 22 and May 15, 1944. The two models differed in having varying degrees of armor protection. Not surprisingly, calculations had shown poor range and performance characteristics due to high takeoff weights. At the end of 1944, the concept was still under development, but the course of war did not permit completion and the Me 262 A-3a failed to enter service. Interestingly, the Me P 1106 was also designed as a Panzerflugzeug fitted with a well-armored cockpit, weapons bay and fuel tanks, but this variation too remained a paper project.

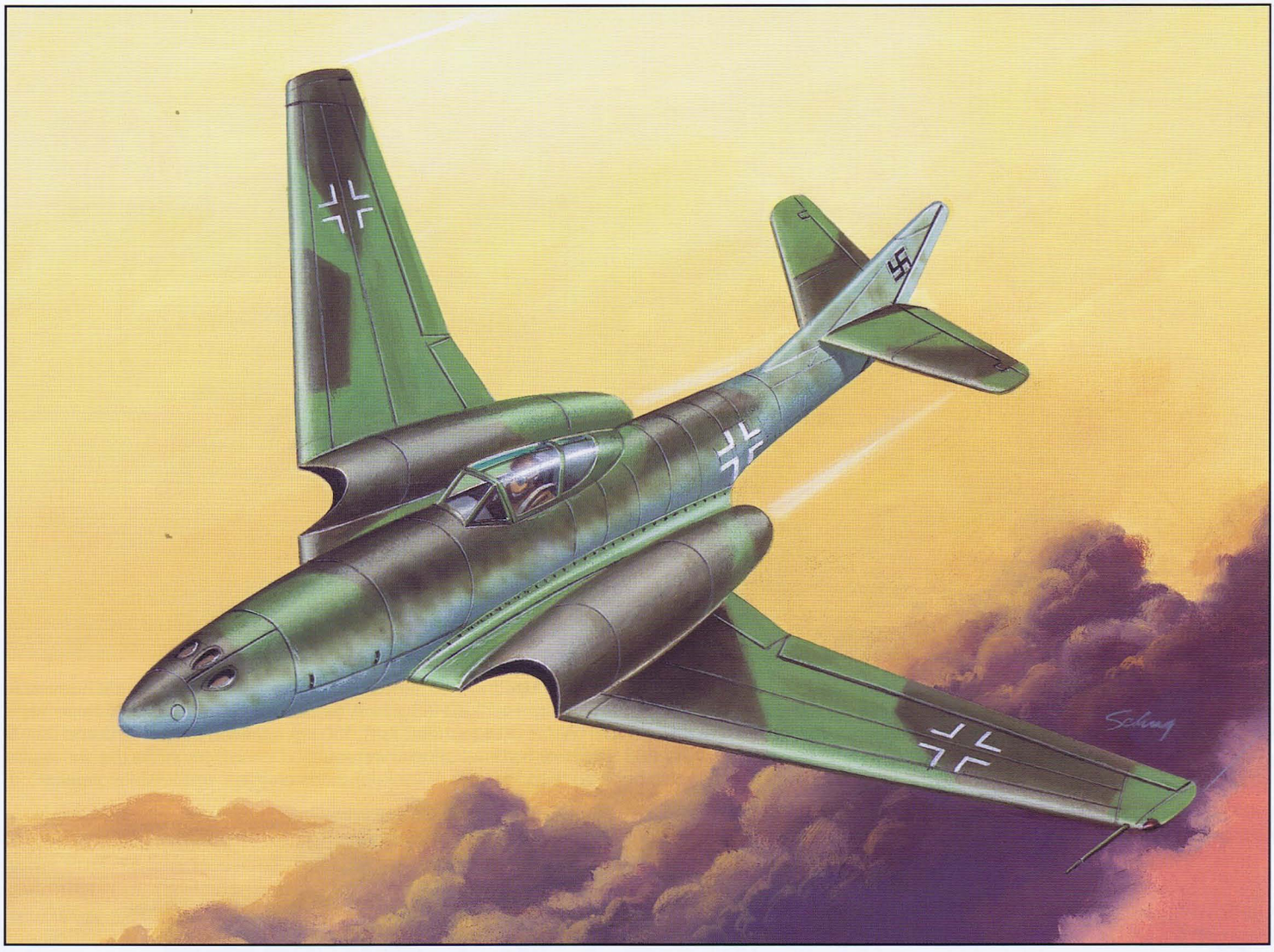
As the end of the war approached, there was no possibility of installing more powerful turbojets within the Me 262 program. The failure of the Me 262 A-1b powered by two BMW 003 A-1s, meant that the Jumo 004B became the standard powerplant of the Me 262 A-1. Nevertheless, it was planned to replace the Jumo 004Bs by Heinkel-Hirth turbojets as soon as possible. During the final days of February 1945, the German Fertigungsführung (War Production Coordination Board) believed that the first series HeS 001 A-0s (pre-production units) and A-1s (full production model) would be delivered during March.

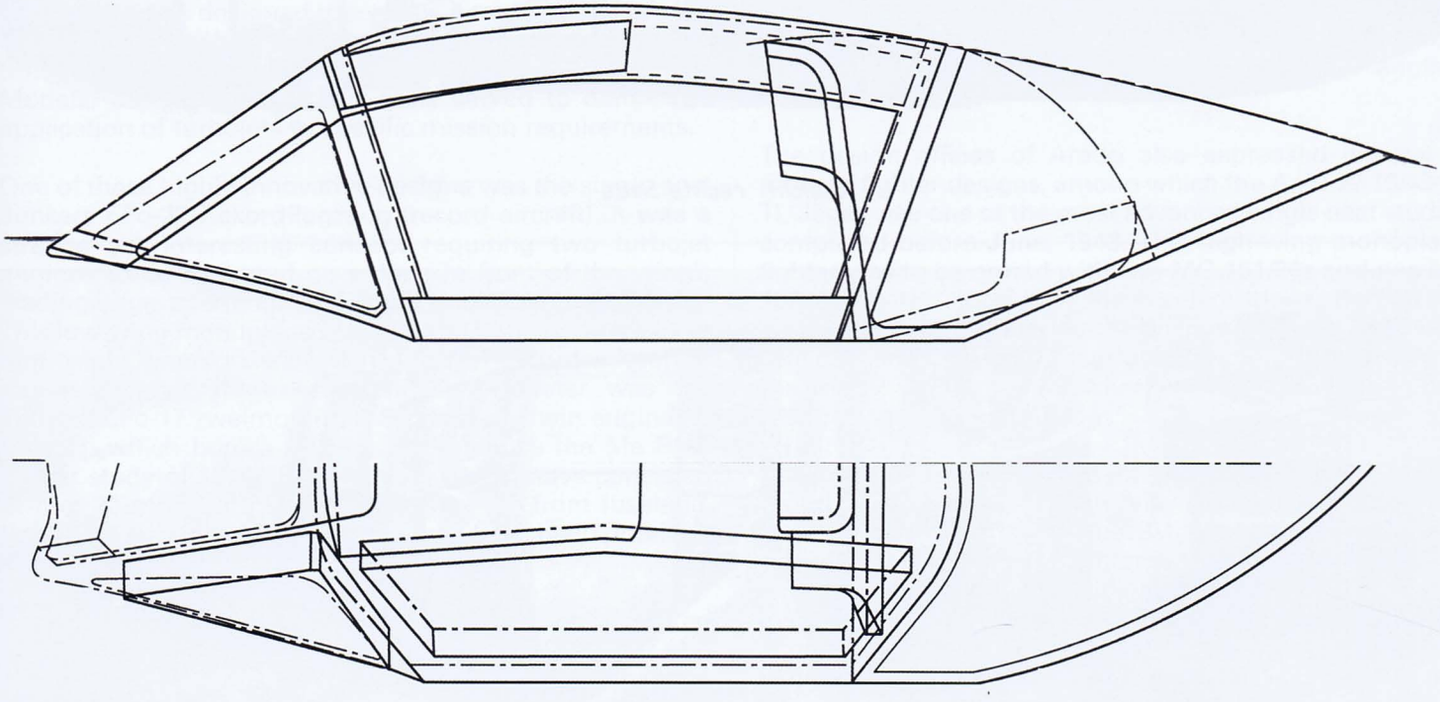
Above: No photographs are known to exist of the Me 262 HG II, W.Nr. 111538, under construction at Lechfeld during the last weeks of the war. Stephen Muth's scale model is an accurate representation.
Opposite right: An artist impression of the high-speed Me 262 HG III.
Opposite lower: The Me 262 A-3a Panzerflugzeug would have been fitted with additional cockpit armor.

Two interesting advanced fighter developments of the basic Me 262 were proposed early in 1944 under the designations Me P 1099A and Me P 1099B. These two project designs featured standard series production Me 262 wings and tail units, but were characterized by their expanded fuselages, increased crew, and remotely controlled turrets with auxiliary undercarriages.

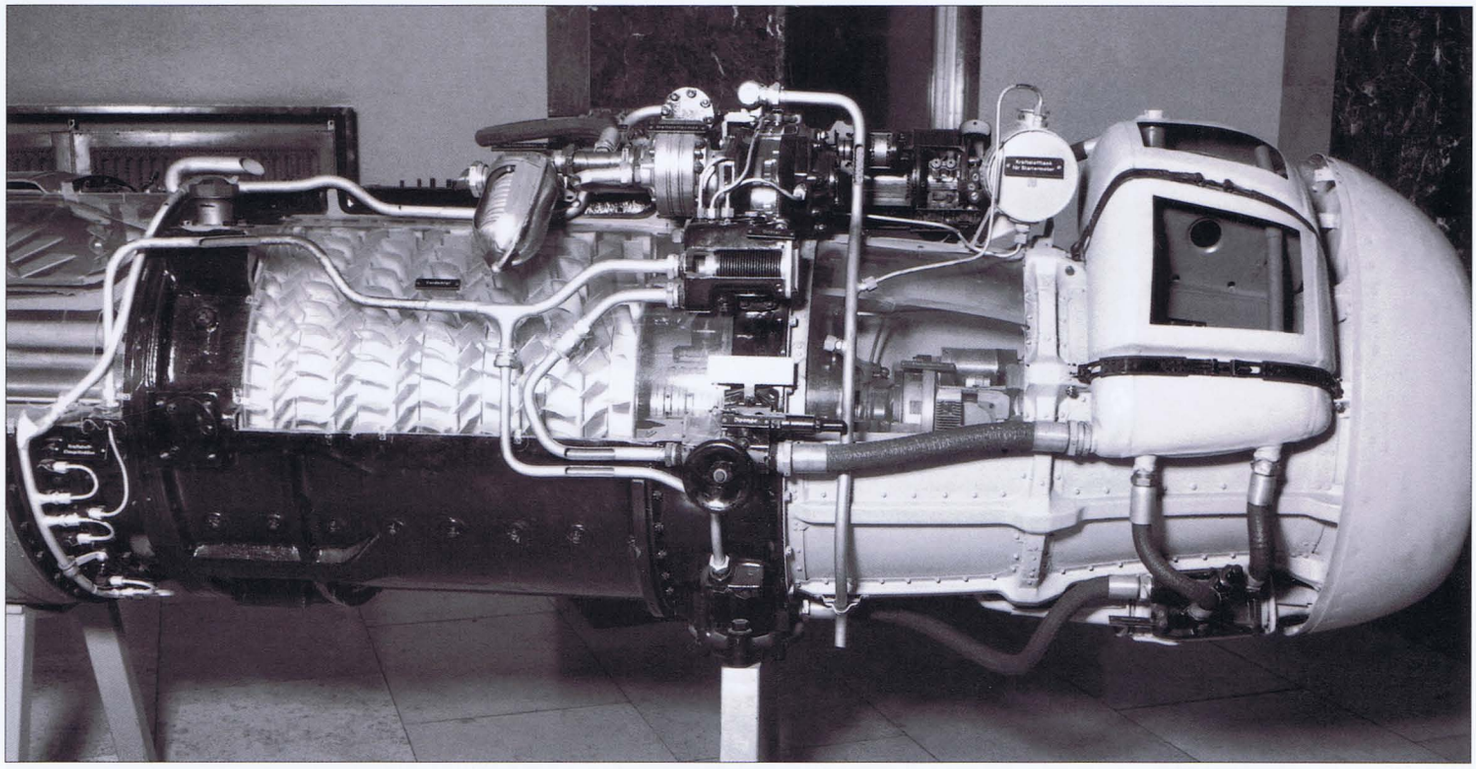
After the RLM decided to reduce and later to halt, production plans for the Me 209 piston-engine fighter, due to the superior overall performance of the jet fighter, the future of the Me 262 was assured even though its early Jumo 004Bs were highly temperamental. Recognizing this, it was decided to introduce the Jumo 004C turbojets to the Me P 1099 which in turn should be replaced with the HeS 011s as these became available. Three different proposals were worked out: the first, proposal A (also called Jäger I) showed a heavy fighter with two or four fixed weapons, or one heavy 55 mm aircraft cannon installed in the forward fuselage below the two-seat cockpit. The Jäger IB version did not differ much from the first proposal, except that it was armed with two MK 103s side by side. The Jäger IC's fixed forward-firing armament consisted of two MK 108s and one MK 103.

The P 1099 zweisitziger Jäger mit 5.5 cm Waffe (two-seat fighter with 5,5 cm gun) carried one MK 112 with forty rounds together with a single MK 108 with eighty rounds, or alternatively, the more powerful MK 214 cannon. Proposal B featured a three-seat fighter with semi-fixed rearward defensive armament of two remote-controlled FPL 151s, two MK 103Zs, and two FHL 151 gun barbettes. Apart from a destroyer and a strongly armed night fighter, it was planned to develop a heavy fighter with four 30mm MK 103s fitted in the front fuselage and a defensive armament of two FPL 151s. The entire crew was protected

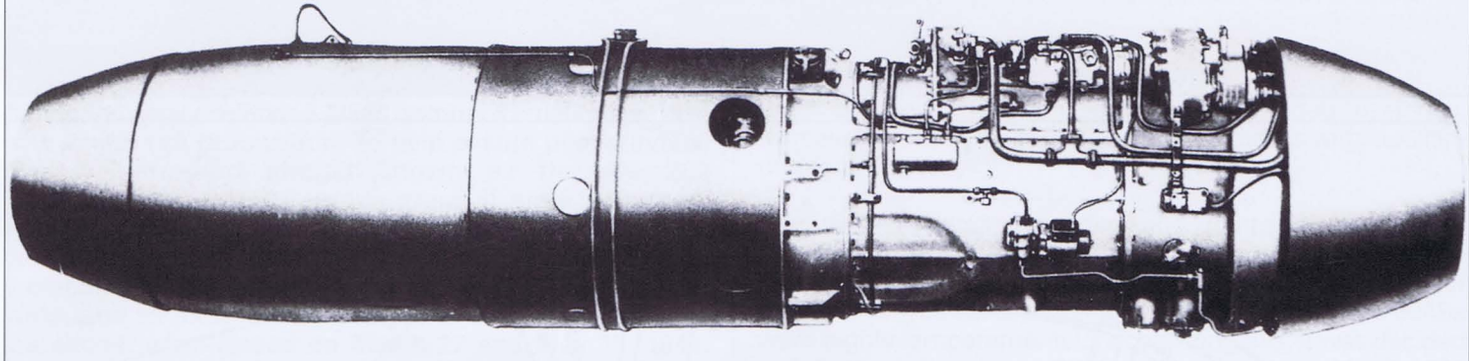




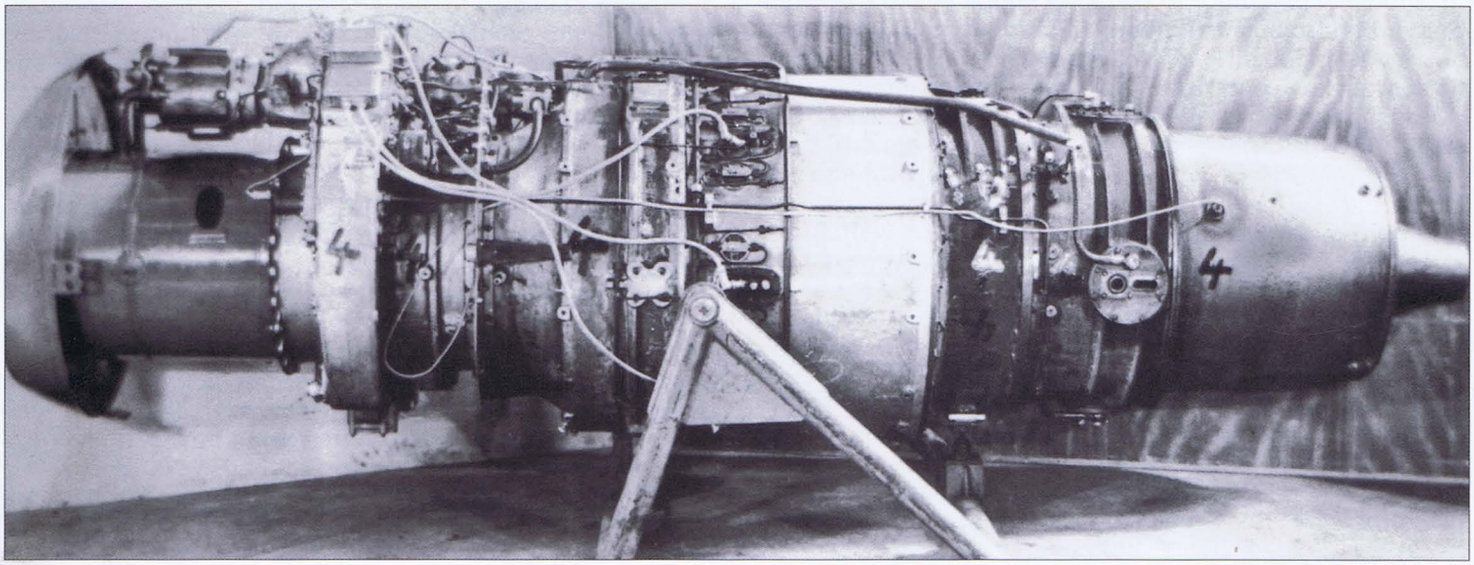
Me 262 A-3a - Panzerflugzeug

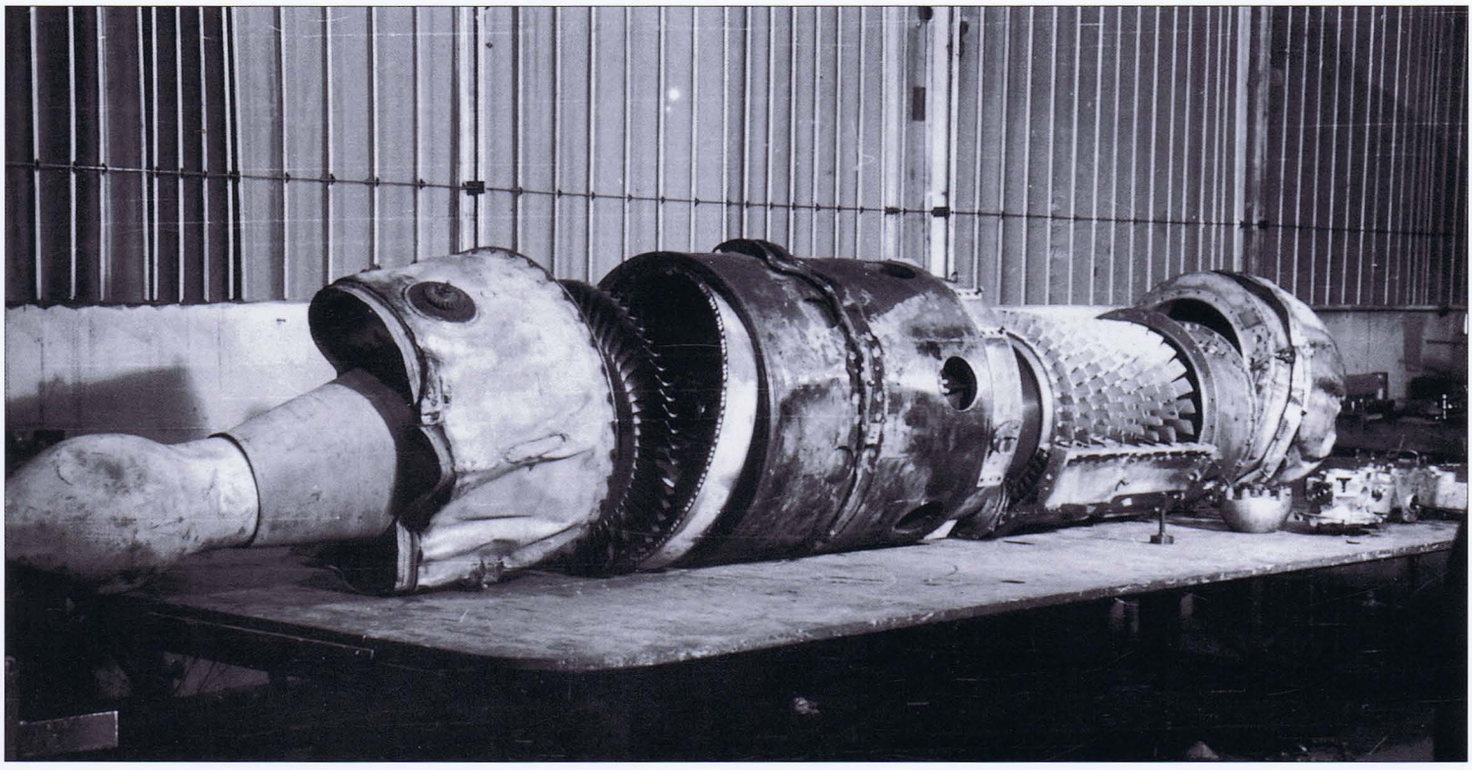


The three jet engines shown on this page represent the principal gas turbines produced in Germany during the war years. The most numerous was the Junkers Jumo 004 B (below) followed by the BMW 003 A (above) with the Heinkel HeS 011 A (bottom) a distant third. All three were essentially axial flow types developing between 1,764 lb (800 kg) static thrust (BMW 003) to 2,866 lb (1,300 kg) s.t. (HeS 011). The Jumo 004 B was in between developing 1,984 lb (900 kg) static thrust. The BMW 003 and HeS 011 had annular combustion chambers while the Jumo 004 employed six individual units. Most of the aircraft projects listed in this book were to use one or more of these engines, or their later versions.



Ansicht: rechte Seite





Above: This Jumo 004 B, recovered from a crash site, has been disassembled for analysis in Prague during 1945. The eight-stage compressor is clearly visible near the front of the engine as is the single-stage turbine at the end. Thrust was controlled by moving the bullet-shaped tail cone restrictor fore (minimum) or aft (maximum).

by armor plating. Both designs, A and B, were equipped with FuG 16 ZY, Peil G 6, FuG 101, FuB1 2 and FuG 25a avionics. Finally, those versions fitted with the HeS 011A jets were to have a pressurized cabin as standard.

When in the early 1940s, it became clear that the Jumo turbojet units would soon become available in good quantities, the Junkers Versuchsanstalt (Test Establishment) evolved a dozen or more multi-engine jet-powered aircraft concept studies designed to explore a multitude of engine arrangements with military applications. Known as the EFo (Entwicklung Flugzeugmodell – Aircraft Development Models) design series, the models served to define the application of turbojets to specific mission requirements.

One of these highly innovative designs was the single-seat Junkers EFo-22 Rekordflugzeug (record aircraft). It was a strange yet interesting concept requiring two turbojet engines to be mounted on pylons in front of the wing's leading edge, seemingly defying a visual center of gravity. This low-wing monoplane was thought to possess qualities that might break existing world speed records. Another interesting, but more orthodox, single-seater was the Junkers EFo-17 zweimotoriger Strahljäger (twin-engine jet fighter), which bore a striking resemblance the Me P 65 fighter study of 1940. Its armament would have consisted of two 20 mm guns housed in the upper front fuselage. Power for the single-seat fighter would have been provided by two Jumo T1 turbojet engines.

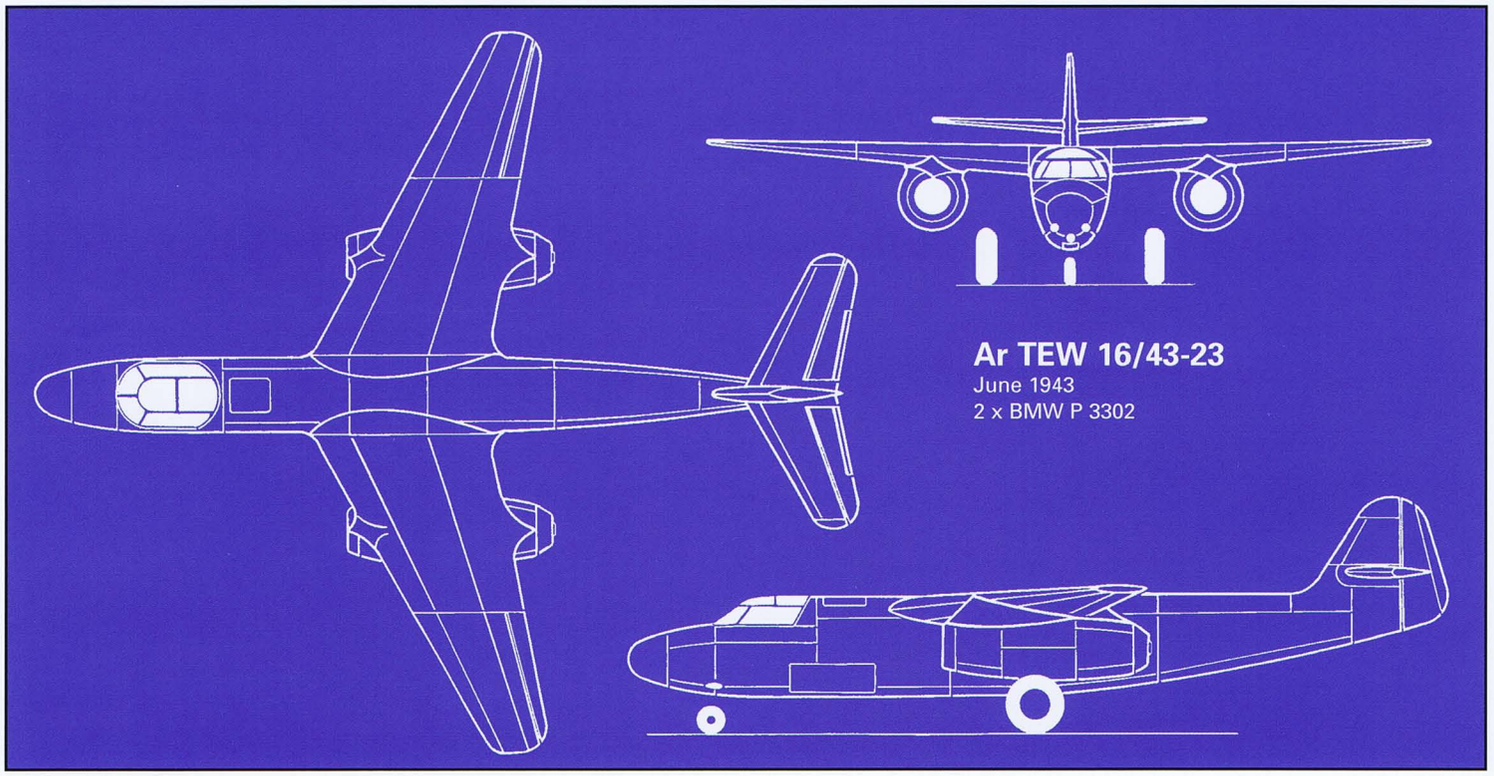
The Junkers EFo-19 zweimotoriger Strahljäger differed from the EFo-17 in its wing design, which called for two Jumo T1s to be buried in the wings (later to be seen in the British Gloster Meteor jet fighter). The armament of two MG 151/20s and one or two MK 103 heavy cannons was positioned in the aircraft's nose.

The early 1940s also saw the Henschel firm, located at Kassel, join in the exploration of jet powered aircraft with their Hs Schnellflugzeug mit zwei TL-Geräten (high-speed aircraft with two turbojets) which was another attempt to create a twin-engine jet fighter. Later, Dipl.-Ing. Nicolaus of Henschel abandoned this project and initiated the preliminary design of the Hs P 135, a tailless single-jet fighter expected to achieve a higher performance.

During the summer of 1943, Arado engineers were busily working on the preliminary design of three versions of single- and two-seat fighters and fighter bombers. One of these proposals, Entwurf 21 (Design 21), called for two Jumo T1 turbojets to be contained within its swallow-like fuselage. Initially, a single air-intake was located in the nose; this was later this was relocated to the wing roots. While initially the two engines were mounted in pairs, a second design placed one Jumo T1 on top of another Jumo T1.

The design offices of Arado also expressed interest in modern fighter designs, among which the Ar TEW 16/43-23 TL-Jäger was one of the most advanced single-seat studies completed before June, 1943. This high-wing monoplane fighter was to be armed with two MG 151/20s and one MK 103 under the cockpit in the fuselage nose. Behind the ammunition bay, there was provision for three large self-sealing fuel tanks. The main undercarriage retracted into the wings, while the nosewheel retracted backwards into the fuselage.

Apart from several single-jet fighters, the well-known Blohm & Voss works at Hamburg also designed a single-seat, twin-jet day fighter, the BV 197.01-01 TL-Jäger mit zwei Jumo 004 (turbojet fighter with two Jumo 004s). The jet engines were mounted side-by-side in the rear fuselage, creating the need for an extra-wide fuselage. The location of the jet engines was made possible by the sweptback wing mounted low on the fuselage. Apart from the fact that the tailplane was mounted high on the fin in the manner of a T-tail, the front elevation belied its broad fuselage cross section. Adopting a decidedly modern look, the leading edge of the large fin was sharply swept back. The method



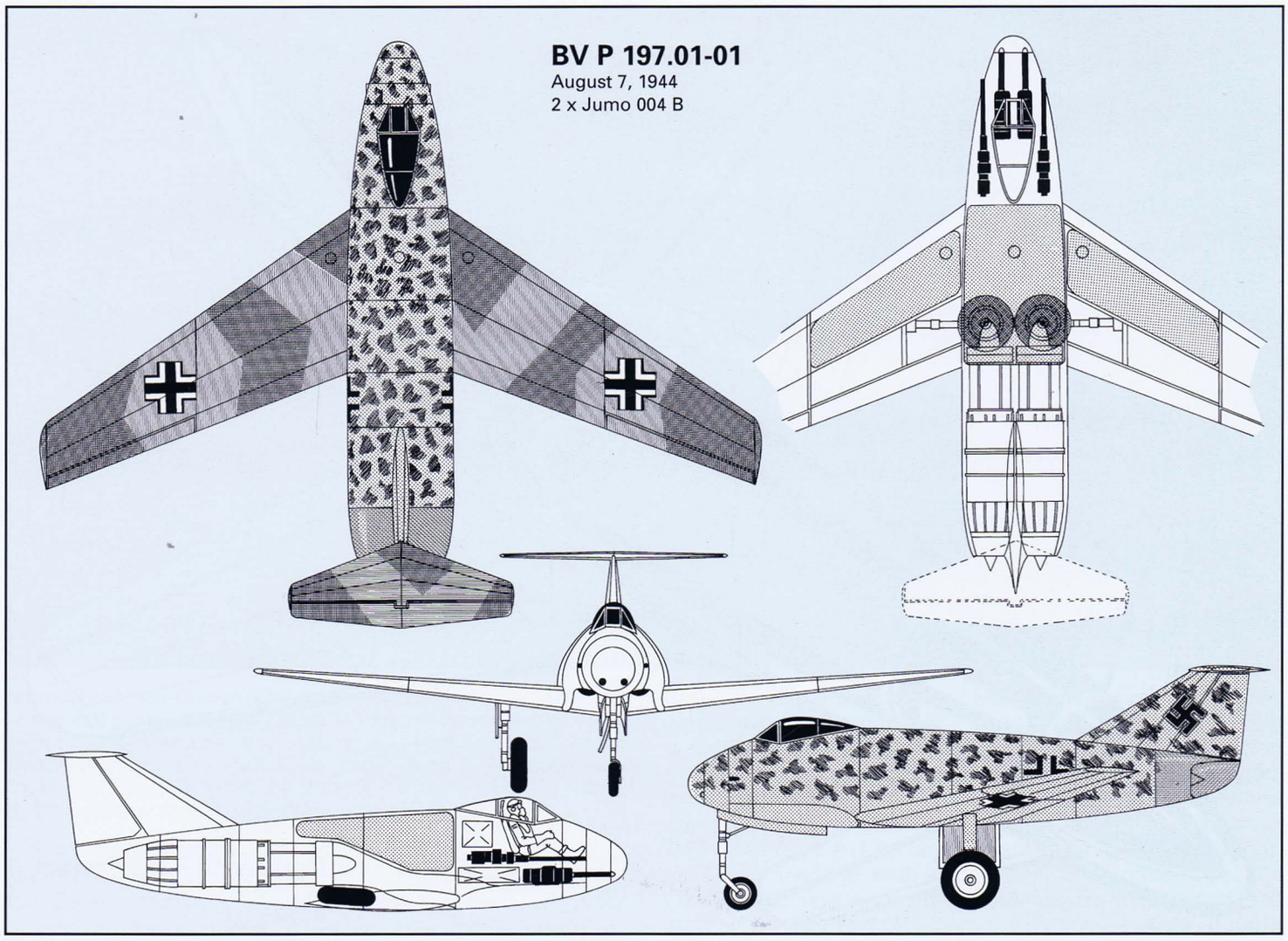
chosen for delivery of air to the twin engines was highly unusual consisting of dual submerged intake ducts leading from the underside of the forward fuselage to the wing root area in the rear, where they turned sharply upward. One cannot help but believe this approach, if actually built, would have proved undesirable. Armament for the BV 197.01 was initially intended to be two MK 103s installed under the cockpit, and an additional MG 151/20 on each side of the fuselage. Optional weaponry also included air-to-air missiles. The estimated speed at optimum combat weight was 659 mph (1,060 km/h) at 29,500 ft. (9,000 m) altitude.

Around the end of October 1944, when Focke-Wulf engineers were finalizing the single-jet, single-seat Ta 183 at Bad Eilsen, another team of engineers began detailed design studies of a twin-engine fighter, the Fw 250[11] zweimotoriges TL-Jagdflugzeug mit HeS 109-011 (twin-turbojet fighter with HeS 109-011). Three different variant proposals for the Fw 250 were investigated. These consisted of a standard fighter, an extended-range fighter, and a fighter bomber. In order to avoid costly design mistakes, only proven standard components were to be used. The two turbojet units were buried within the rear fuselage. There was just enough space between the air-intake ducts for either an SB 1000 bomb (or other similar ordinance), or an auxiliary fuel tank. The split-intake ducts lead around the cockpit and converged in front of the cockpit, forming a large intake orifice. Operating on only one engine, a maximum speed of about 420 mph (765 km/h) was expected. With a fuel load of about 3,570 lb. (1,620 kg) and a takeoff weight of 16,315 lb. (7,400 kg), endurance at about 45,900 ft (14,000 m) was calculated to be 45 minutes. If the fuselage fuel load was increased to about 6,600 lb. (3,000 kg), the fighter's maximum range would rise to 1,515 miles (2,440 km). Later, it was calculated that a speed of about 538 mph (865 km/h) at 36,000 ft (11,000 m) would be possible. With reduced thrust, endurance would increase to 3.74 hours at the ceiling of 36,000 ft (11,000 m). The maximum speed expected was at least 668 mph (1,075 km/h). Armament of the single-seat fighter was to consist either of the MK 108 (120 rpg) or the MK 213 (180 rpg), and two MK 103s with seventy-five rounds each, placed next to the air-intake and on the sides of the cockpit. The undercarriage retracted into the wings and between the bifurcated air-intake. The wings and the horizontal tail were swept back. Although Focke-Wulf submitted a comprehensive description, there was too little time to realize this promising jet fighter proposal.

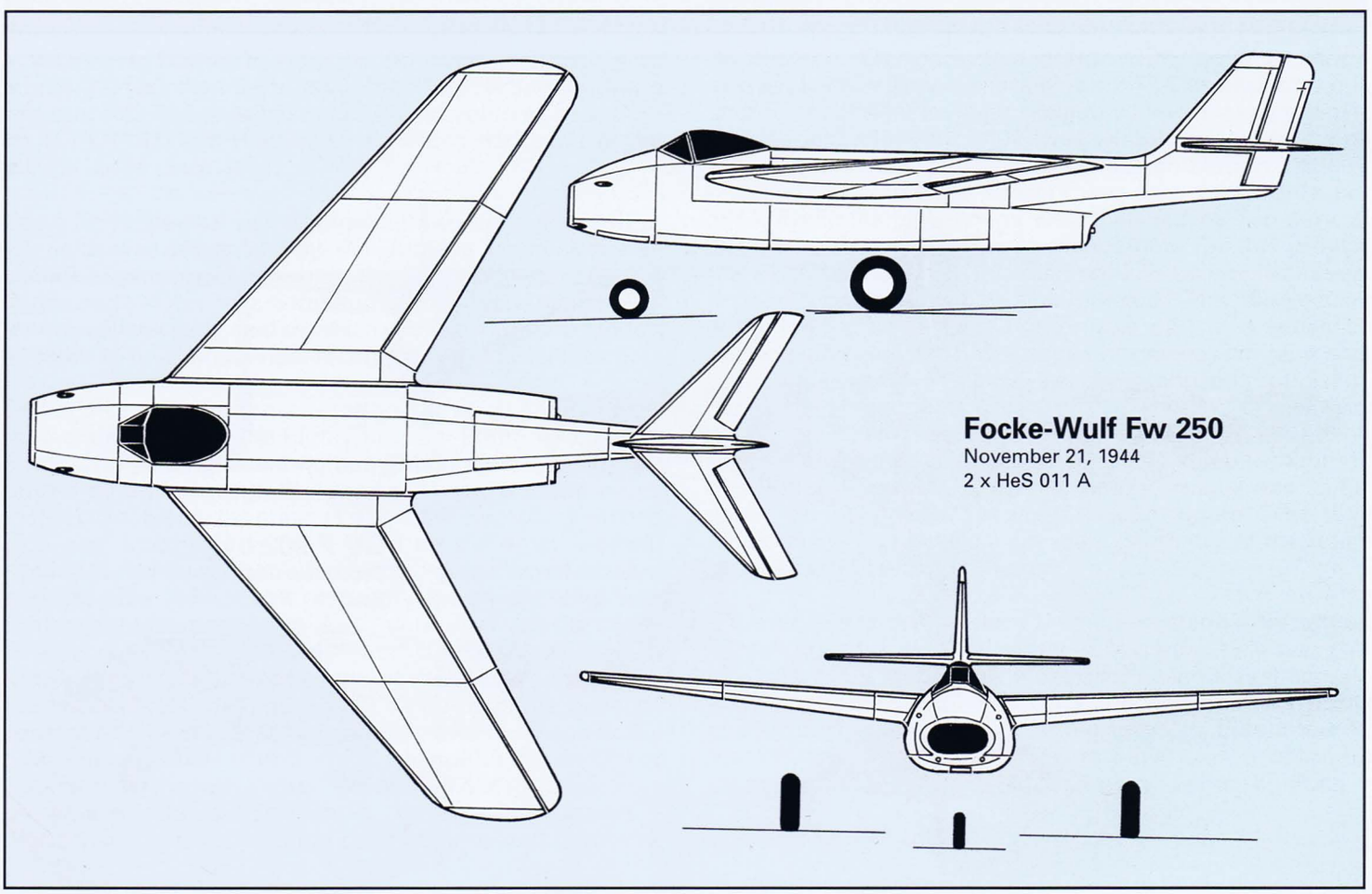
A high-altitude, single-seat jet fighter design, the Fw Höhenjagdflugzeug mit BMW 018 was also evolved by Focke-Wulf. This project differed little from the Fw 250, but featured an increased wingspan. Performance data for this fighter project were compiled in October, 1944. The fighter had a pressurized cockpit and reduced forward-firing armament. Only fragments of the performance data have survived. Because the maximum thrust of one BMW 018 was less than that of two HeS 011s, maximum speed was reduced by about 12.5 mph (20 km/h) at altitudes between about 13,000 ft. (4,000 m) and 42,650 ft (13,000 m). The BMW 018 was still under development at the end of hostilities, and further development was stopped. The staff working on this design soon transferred to the Ta 183 program.

Not surprisingly, very few fighter projects powered by three or more turbojets were given consideration. However, one of them was the Dornier Do Dreistrahliges Jagdflugzeug mit HeS 011 (three-engine jet fighter with HeS 011). Since the Dornier design office was fully occupied with the development of various heavy fighters, night fighters and destroyers based on the Do 335, as well as cooperating with Heinkel and Junkers in the development of the four-engine long-range reconnaissance Ju 635, very limited capacity was available for other advanced designs. Dornier began studies of a fast multiple-jet pursuit plane in 1944. The design study covered development of a high-performance jet fighter of the canard tail-first type — the very opposite of other tailless designs. Power was provided by three HeS 011 turbojets arranged in cloverleaf fashion. Air was fed through a fuselage duct and from wing boundary layer suction slots. The pilot sat in the fuselage nose. Professor Dr. Claude Dornier and his son, Peter, maintained that the tactical range would be greatly increased by shutting down

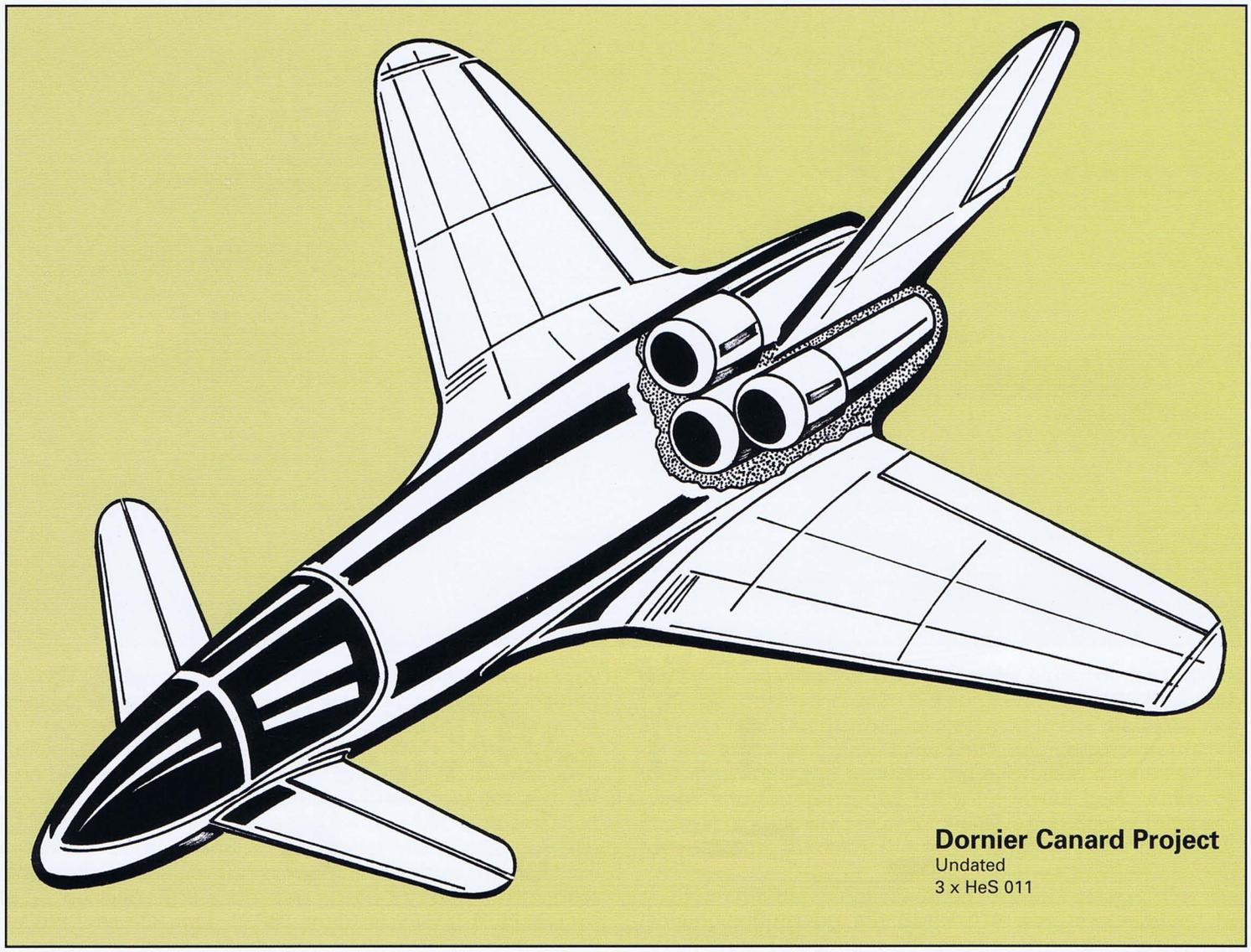
11 The RLM GL/C number 250 had previously been assigned to Blohm & Voss for their BV 250, a large land-based transport project based on their successful BV 238 six-engined flying boat.



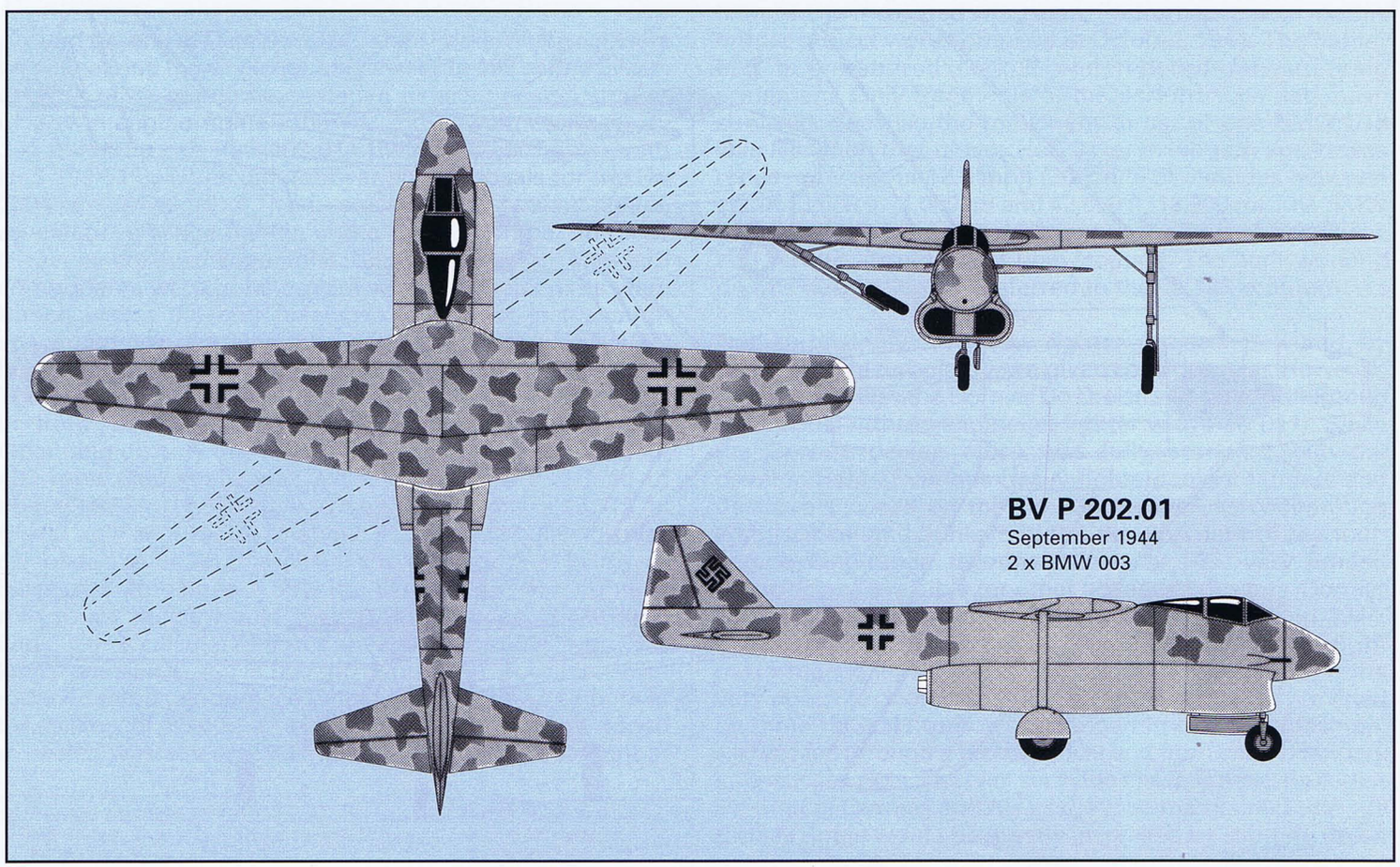
BV P 197.01-01
August 7, 1944
2 x Jumo 004 B



Focke-Wulf Fw 250
November 21, 1944
2 x HeS 011 A



Dornier Canard Project
Undated
3 x HeS 011



BV P 202.01
September 1944
2 x BMW 003

Above: The Ames-Dryden AD-1 scissor wing research aircraft tested a wing that could pivot fore and aft to form oblique angles up to 60 degrees. Tests revealed that the scissor wing decreased aerodynamic drag, permitting higher speeds and longer range. The concept was not new. Dr. Vogt designed the BV P 202 (shown opposite), with a similar scissor wing that could pivot up to 35 degrees.

two of the three engines, without any additional air-flow drag. The Dornier canard design study was canceled, primarily due to problems arising from the unperfected Heinkel-Hirth powerplants.

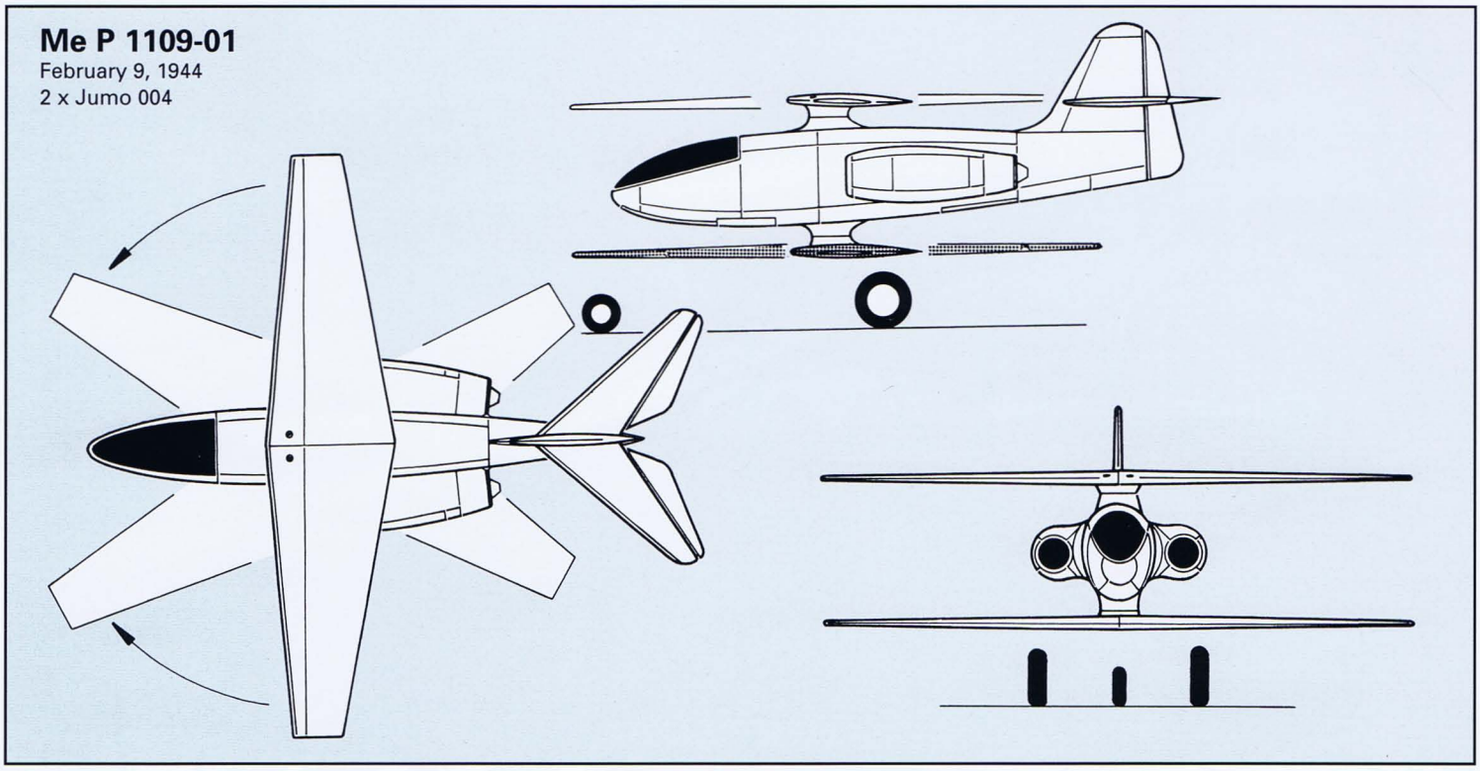
In addition to Dornier's plans, the Henschel specialists were working on a powerful tri-jet fighter. The Hs Jagdflugzeug mit drei HeS 011 was the next to be developed after their Hs P 73, P 87, and P 90 canards, which had been at the design stage since 1941.

The sole single-seat fighter project powered by four turbo-jet units was advanced by the Junkers Versuchsanstalt purely as a design study under the designation Ju EFo-018 Jagdeinsitzer mit vier Strahlturbinen. This concept was among several early studies which evolved into scale models in order to investigate new technological possibilities.

Perhaps one of the most unorthodox of all the German project designs was the highly unusual Blohm & Voss BV P 202 twin-jet single-seat fighter. This project was characterized by a high wing, designed to swivel in flight on its vertical axis, giving the effect of a variable sweepback on one side, and a variable sweptforward on the other, without altering the center of lift. In effect, one wing was swept-forward and the other sweptback. In theory, when the wing was swung from its central position, the normal velocity of the air flow over the leading edge was progressively reduced in relation to the forward speed of the aircraft. Since it is the speed of normal flow which determines the onset of compressibility effects at high speeds, it would theoretically have been possible with this wing design to obtain higher speeds with a given thrust. It was difficult to predict the possible effects of this peculiar arrangement upon the flight characteristics, and the concept remained unproven until 22 years after the war . Maximum swivel of the wing was thirty-five degrees. For takeoff and landing, the wing was set in its normal position, since it was only in this position that the flaps and main undercarriage could be operated. In this way, one of the major drawbacks of the swept wing, namely control problems at low speeds, was overcome. Two BMW 003 A-1 turbojets were enclosed in a bulge in the lower fuselage, with a common intake in the nose. The empennage was conventional. A fixed armament of one 30mm MK 103 and two 20mm MG 151/20s was thought possible.

Another equally innovative design with movable wings was evolved by Messerschmitt as a 2-TL-Doppeldecker mit Drehschiebeflügel (twin-jet biplane with swiveling wings). This project, the Me P 1109, was without a doubt, one of Messerschmitt's most unorthodox design studies. Initially designated P 1101, the concept was first drafted in early 1944. Preliminary drawings were finished by February 2, 1944, but, thus far, no performance data for this project have been uncovered. It is also not known whether even a wind-tunnel model was completed. The single-seat experimental sweptwing fighter was part of a series of projects designed with the object of developing new and unproven aerodynamic theories. The proposed propulsion consisted of two HeS 001s installed side-by-side in the fuselage. The mechanism for moving the upper and lower wings was located behind the large fuel compartment aft of the pilot's cockpit. A tricycle undercarriage was to be used, but no precise drawings are known to exist that would show just how the complex geometry of the main gear retraction was to function.

Another less radical (at least by modern standards) fighter aircraft design submitted to the RLM during 1944 was the Messerschmitt Me P 1102. It featured a single-seat aircraft with a variable wing sweepback mechanism. This basic aircraft design, powered by three turbojet units, (one of them in the rear fuselage), was to have been adapted to other combat roles, including that of the fighter-bomber.



Above: The Me P 1109-01 of February 2, 1944, was a highly unusual twin-engined biplane in which the top and bottom wings could pivot in opposite directions. Power was to be supplied two Jumo 004 turbojets. A tricycle undercarriage was planned, but it is unclear how the mainwheels would be stowed.

Turboprop Fighter Aircraft

One of the more advanced German turboprop fighter project designs was the Focke-Wulf project Fw 226 B einmotoriges Jagdflugzeug mit PTL 021 (single-engine fighter with turboprop engine 021). This project, initially known as Entwurf 7, was under study at Bad Eilsen during the summer of 1944.

On August 18, 1944, plan description Nr. 281 was issued for a small twin-boom interceptor, similar to the HeS 011-powered Flitzer , an additional feature of this design was rocket propulsion which would have permitted the interception of fast enemy aircraft. Its main power was to be provided by an HeS 021 turboprop, which was essentially an HeS 011 modified to drive a propeller. A long drive-shaft protruding forward from the engine drove the propeller in the nose of the Fw 226 B, which had reportedly received the code name Peterle (Petrel, a migratory sea bird). This project would have been quite similar to, and had a high degree of commonality with, the Flitzer apart from the aircraft's nose section.

Compared with the Fw einmotoriger TL-Jäger mit R-Gerät (single-engine jet fighter with rocket system), which was proposed to have an HeS 011R, the improved twin-boom single-seat fighter offered increased maximum speed, a better climb rate, and also a higher service ceiling.

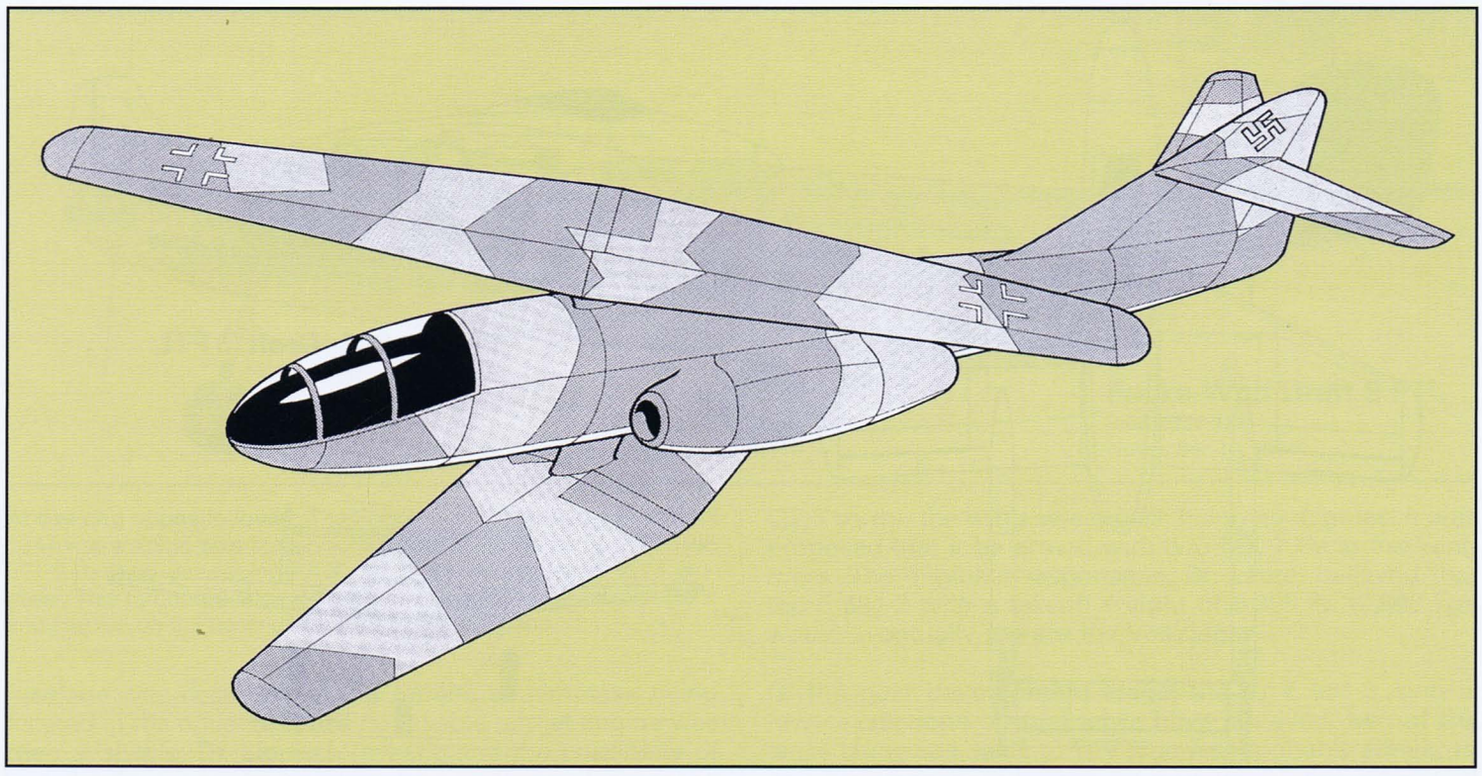
The aircraft possessed a wing area of about 183 sq ft (17,0 sq m) a wingspan of about 26.3 ft (8,0 m), and an overall length of 32.5 ft (9,9 m). The fixed armament consisted of four MG 151/20s and two MK 108s. Because of the location of the wheel wells for the main undercarriage, the ammunition containers for the wing guns had to be accommodated in the center fuselage. A Revi 16C gun- sight was to be fitted as standard, but replaced by the ZFR 4a[12] if MK 103s were used. The pilot sat in a pressurized cockpit. The official description does not mention an ejection seat but it was likely this would have also been standard. The fire protection equipment was in four sections: fuel compartments, engine and the two outer wings; it was adopted from a Junkers design. The Dachlaurin fire extinguisher consisted of two 1.32 US gallon (5 liters) bottles. Fully equipped, its weight reportedly reached about 11,000 lb. (5,000 kg). The maximum speed was calculated at 559 mph (900/km/h) at 32,800 ft (10,000 m) altitude and 525 mph (845 km/h) at ground level. A maximum ceiling of 49,200 ft (15,000 m) was expected.

Focke-Wulf engineers were also working on an advanced einmotoriger PTL-Kampfjäger (single-engine turboprop fighter-bomber), broadly based on the Fw 226, and possibly known as Entwurf 8. It would have been characterized by swept wings, a single-tail assembly with swept surfaces, and powered by an HeS 021 driving a metal prop in the nose. The air intakes, positioned at the wing roots, were similar to those found on the Fw 226.

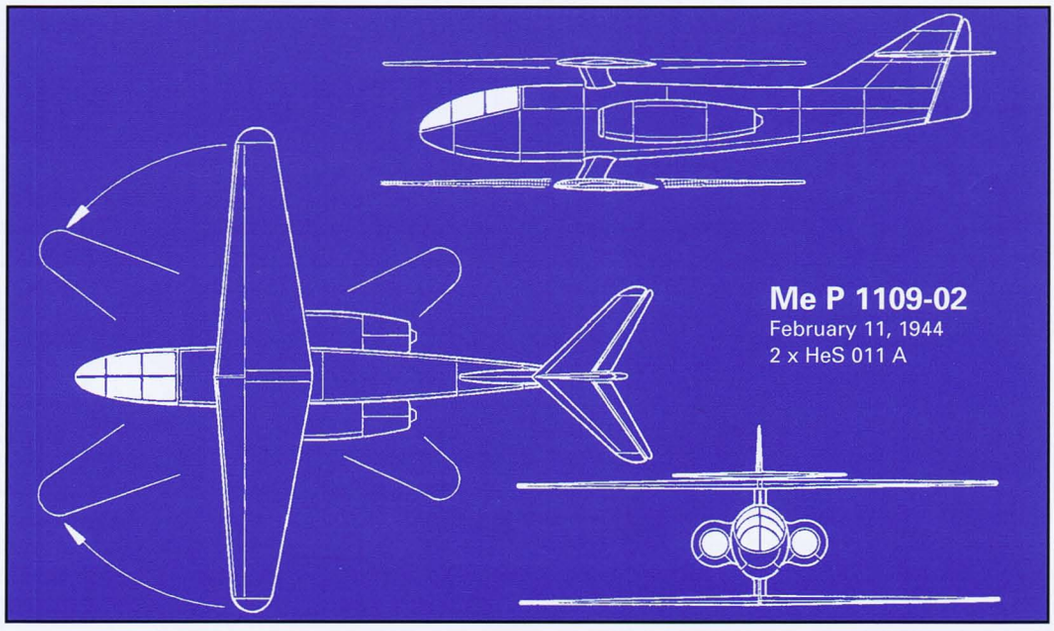
Tailless and Flying-Wing Fighter Aircraft

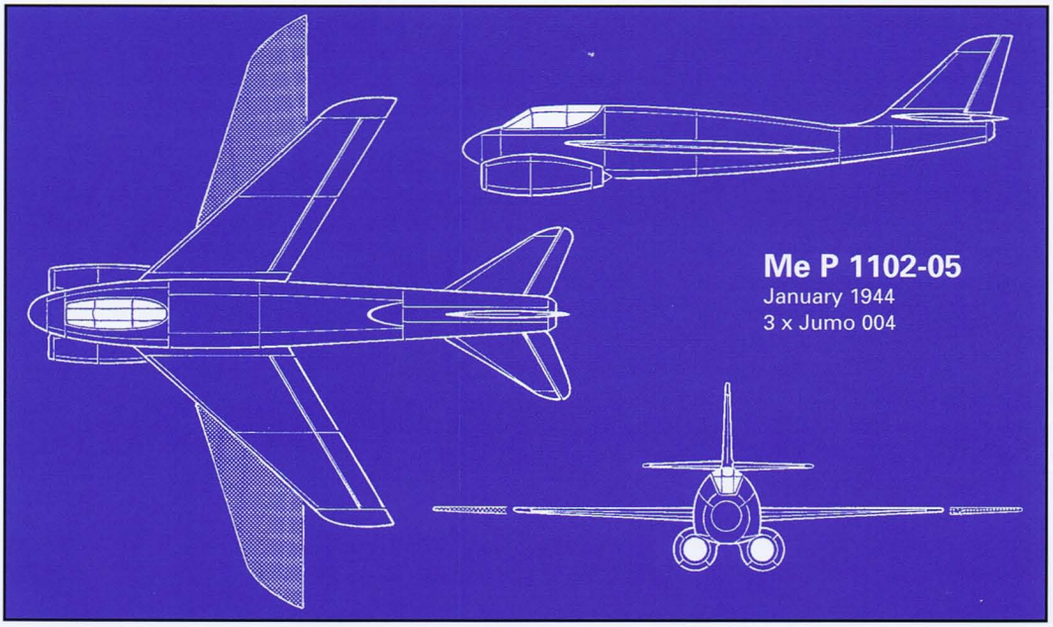
Early in April 1939, Dr. Alexander Lippisch, a talented young engineer who dedicated himself to the development of tailless aircraft, designed a tailless fighter to be powered by a ramjet, the Li P 01-110, which had a length of 18.3 ft (5,58 m) and a wingspan of 19.7 ft (6,00 m). The fuselage diameter was only 4.1 ft (1,25 m). The pilot was seated in the front of the fuselage, which ended in a central fin. The design was quite similar in layout to the aircraft which ultimately became the Me 163. Following further studies, it became obvious that the clipped wings were too small. The design was therefore reworked during the summer of 1939. On October 20, 1939, while working at Augsburg, Dr. Lippisch finished detailed drawings of a tailless flying-wing single-seat fighter with a very short nose under the designation Li P 01-111 Deltajäger (delta-wing fighter). The sweptback aircraft was only about 19.7 ft. (6.0 m) long and was equipped with landing skids in lieu of a conventional undercarriage. A fixed armament consisting of two MG 151s housed in the wing roots was proposed. Most of the

12 ZFR 4a – Zielfernrohr – Telescopic gunsight 4a

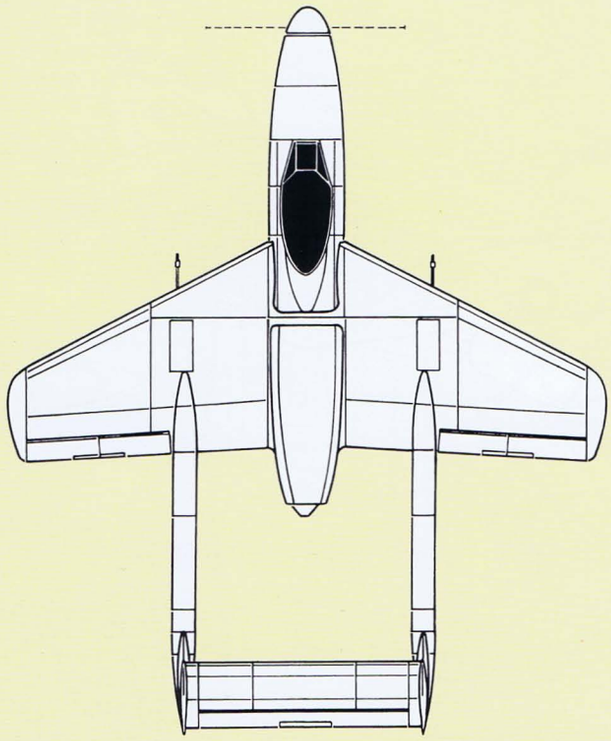


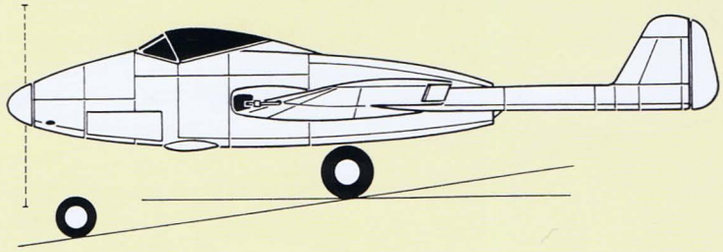
Above and right: This variation of the scissor biplane, the Me P 1109-02 of July 11, 1944, shows a slightly larger aircraft powered by two HeS 011 A turbojets. Messerschmitt engineers believed, as did Dr. Vogt of Blohm & Voss, that a scissor wing layout would facilitate higher speeds. It was reasoned that having two wings would eliminate any asymmetric deficiencies that they perceived may be linked with the single scissor wing. Each wing could pivot through 60 degrees.



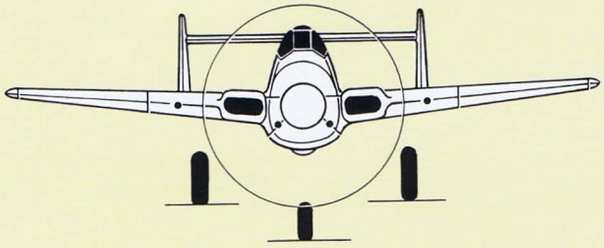


Left: The Me P 1102 / 5 was a 1944 fighter-bomber project powered by three Jumo 004 turbojets and equipped with a variable sweep wing. It was also to be fitted with a tricycle undercarriage in which the nosewheel was located in the nose between the two engines. The air intake for the tail mounted engine was located at the base of the fin.

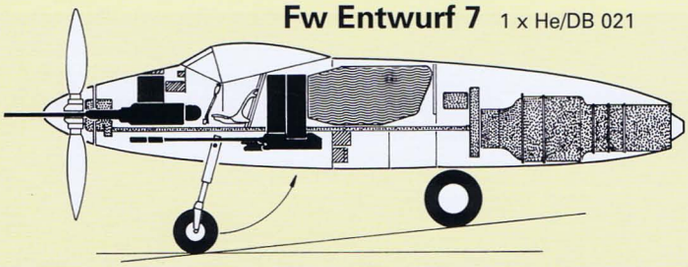




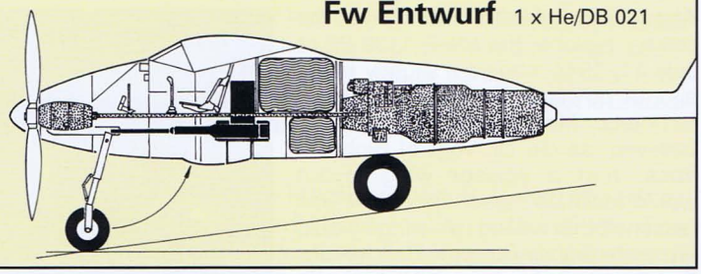
Fw Fw 281- Draft 7 PTL
Peterle - July 18, 1944

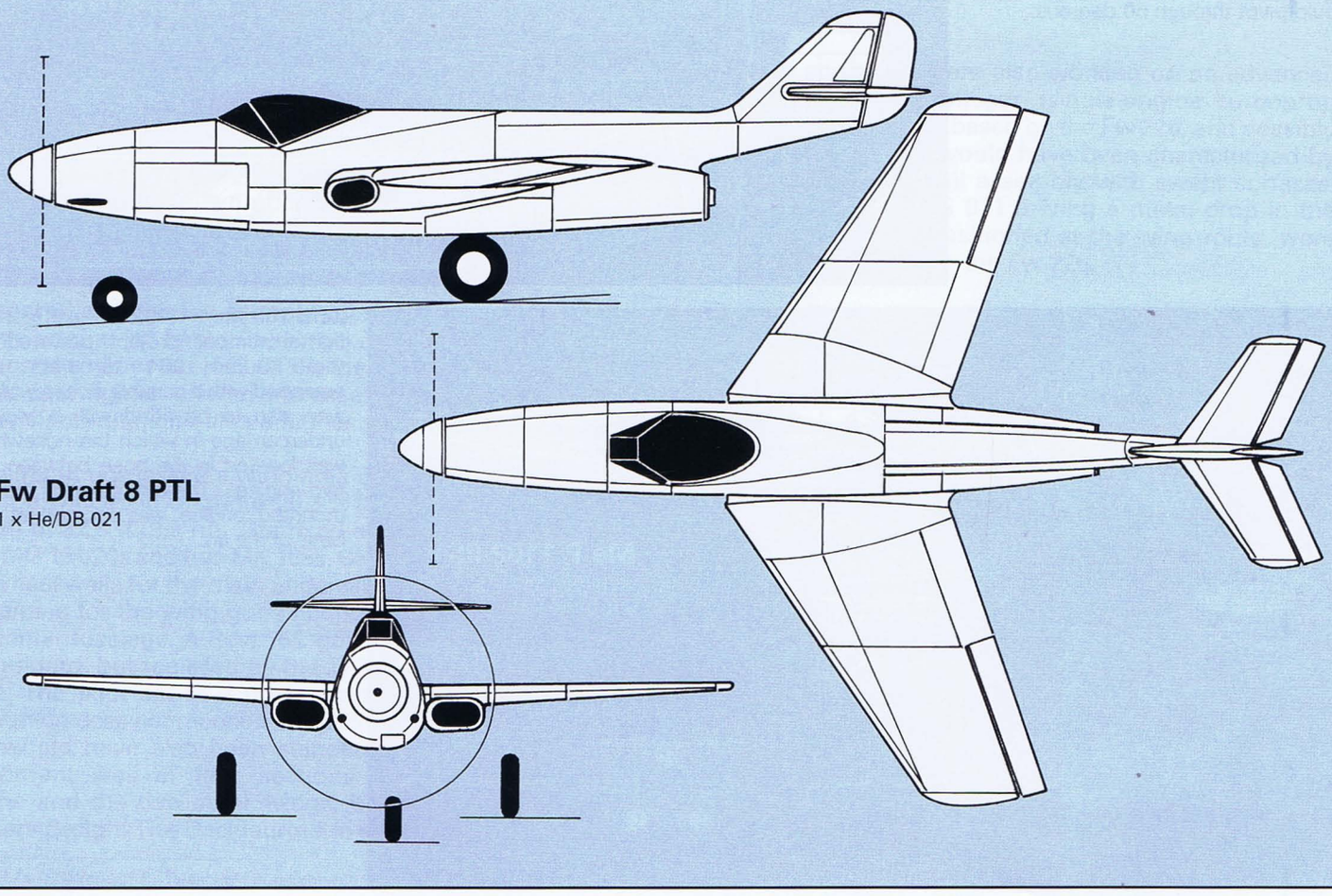


Fw Entwurf 7 1 x He/DB 021

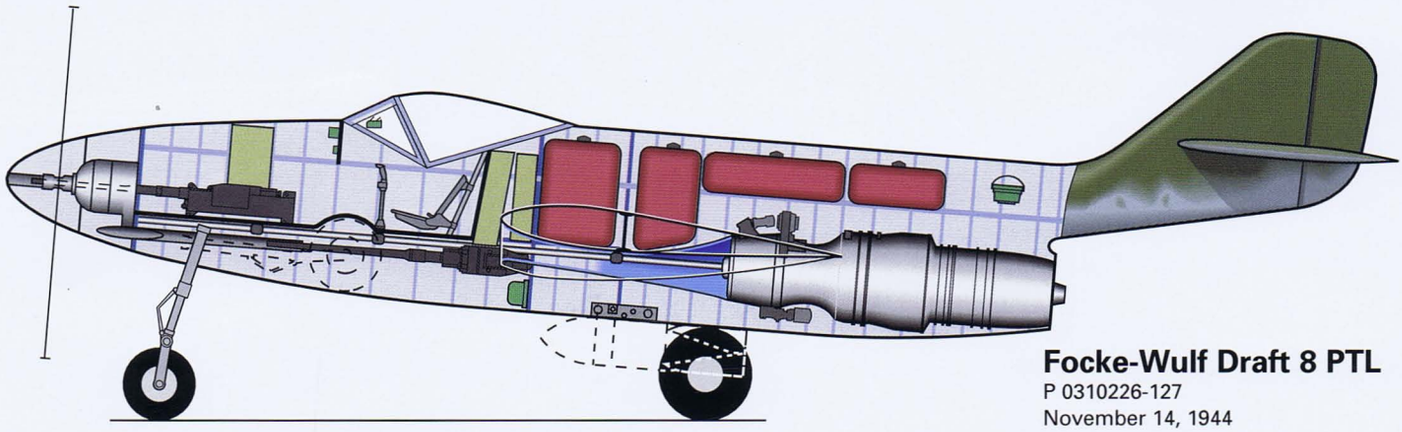


Fw Entwurf 1 x He/DB 021





Fw Draft 8 PTL
1 x He/DB 021



Focke-Wulf Draft 8 PTL
P 0310226-127
November 14, 1944

Above and opposite lower: The Focke-Wulf P 0310226-127 of April 1944 was a single-seat fighter-bomber project powered by a DB/HeS 021 turboprop developing 2,400 hp driving a six-bladed VDM propeller. This turboprop engine was jointly developed by Daimler-Benz and Heinkel on the basis of the HeS 011 gas turbine.

fuselage was occupied by the ramjet, its air-intake being located in the nose. Because no reliable ramjet engine was then available, Dr. Lippisch investigated the possibility of installing two early turbojets to be supplied by Bayerische Motorenwerke AG. (BMW – Bavarian Motor Works) located at Allach near Munich.

After two more tailless aircraft design studies (Li P 01-113 and Li P 01-115) had been evolved, each with composite powerplants, Lippisch designed the L1 P 01-116 Strahljäger (jet fighter) during the summer of 1941. This single-seat fighter with a span of 29.5 ft (9,0 m) had been under study since early 1939; the proposed powerplant was an early type of ramjet. The Li P 01-116 was a small compact design, with an overall length of only 23.2 ft (7,06 m). This advanced tailless fighter design was armed with two MG 17s installed under the cabin and two MG 151/15s alongside the air-intake. The ammunition was stored just behind the cockpit. The small turbojet was placed in the lower fuselage of the midwing design, and had wings which resembled those of the later Me 163. The location of the engine was not considered acceptable, since the air-intake was too close to the ground, creating a fear that debris would be sucked into the intake and cause damage. Further development of this project was therefore terminated.

By the end of 1944, several other aircraft manufacturers, in addition to Lippisch and his "Department L" at the Messerschmitt works, were also working on the design of advanced tailless jet fighters.

In Landeshut, Arado engineers created the Ar E 581, TL-Nurflügeljäger (jet-propelled flying wing), a high-wing, tailless, single-seat fighter powered by a single jet unit mounted in the fuselage. The mainwheels of the tricycle undercarriage retracted forwards into the wing, which carried twin fins and rudders. The five proposals submitted differed in their powerplants. The Ar E 581-1 (E = Entwurf – Design) was designed in autumn, 1944, and was abandoned due to the non-availability of Jumo turbojet units, as well as unresolved problems associated with the design of the fuselage.

The Ar E 581-2, to be powered by a BMW 003 turbojet, and possessing a fuel capacity of about 195 US gallons (740 liters), was under consideration in November, 1944. The light-weight fighter had a wing area of about 242 sq ft (22,5 sq m), the wing sweepback being 46 degrees. It was proposed that it be armed with two MK 108s in the wing roots. The engineer responsible, Dr. Laute, believed that the E 581-2 with a takeoff weight of 6,305 lb. (2,860 kg), would eventually replace the Volksjäger.

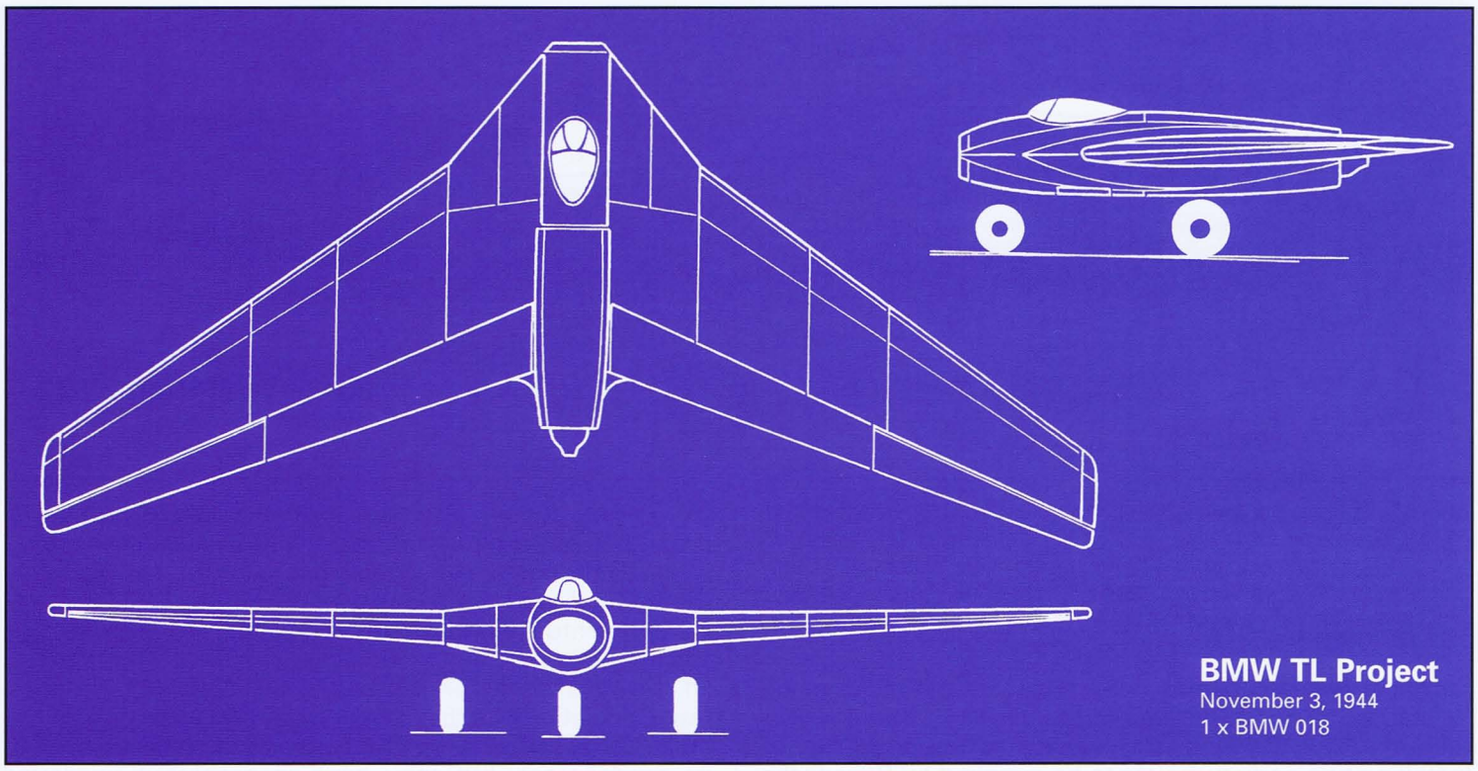
Of the next development stage, the Ar E 581-3, only a few calculations on fuel tanks have survived, two of the tanks being self-sealing. The type was probably similar to its predecessor, but may have incorporated improved passive protection.

The following design, the Ar E 581-4, probably was the first variant of this type designed to accept the more powerful HeS 011 A-1 turbojet. It had one large air-intake, which divided in front and converged behind the cockpit.

A general arrangement drawing of the Ar E 581-5 project TL-Nurflügeljäger with HeS 011 was finished on January 8, 1945. This presented an aircraft with a bifurcated air-intake. Between the ducts, there was provision for two fuel tanks. The wingspan and general configuration were similar to the E 581-4.

On October 23, 1944, the Bayerische Motorenwerke finished a report describing five different turbojet fighters, three of which were to be powered by the firm's BMW 003 A-1. One was to receive the HeS 011, while the last design, the BMW TL-Jäger mit 1 BMW 018, was expected to receive the powerful BMW 018 turbojet. The design resembled the Horten layout, but the large engine was housed in the center of the flying wing, behind the pressurized cockpit. The pilot of this heavy day fighter sat between the air ducts leading to the BMW 018 turbojet. The forward-firing armament, probably four MK 108s, MK 213s or MK 013s, was placed between the air-intake and the five fuel tanks of each wing. The full fuel capacity of about 7,715 lb. (3,500 kg) was carried in ten separate tanks in the sweptback wing, wing area being 646 sq ft (60 sq m).

Calculations showed the aircraft was capable of speeds approaching 646 mph (1,040 km/h) at sea level, and 575 mph (925 km/h) at about 39,400 ft (12,000 m) altitude. With full thrust, the BMW jet fighter had a climb rate of 85 ft/sec (28 m/s) at ground level, and about 15 ft/sec (5 m/s) at 46,700 ft (14,000 m). Since there was almost no chance that the BMW 018 would enter production in the near future, BMW deferred further development of the fighter. Additionally, the tremendous effort involved in testing and developing the untried BMW high-altitude, flying-wing fighter with an operational weight of nearly 23,400 lb. (10,600 kg) prevented its realization only a few months before Germany's unconditional surrender.



BMW TL Project
November 3, 1944
1 x BMW 018

The same fate was to befall the advanced Messerschmitt Me P 1111 project, the forerunner of the final design of a single-seat fighter investigated at Oberammergau during January, 1945. Wind tunnel tests revealed that it had approximately the same aerodynamic drag as the slightly larger Me P 1110. The boundary layer problem associated with this design had been overcome by placing the air-intakes in the leading edges of the wings. The intake ducts were shallow and elongated, but the resulting loss of air to the engine which, also resulted in diminished engine thrust amounted to only two to four percent. This appeared to be the best solution to the performance problem while increasing engine efficiency. The Me P 1111 was characterized by its sharply sweptback vertical tail assembly. The deep chord sweptback wing contained 412 US gal fuel (1,500 litres) at full capacity. As with most tailless designs, the ailerons doubled as elevators, and leading edge slots, long preferred by Messerschmitt, were located on the outer wings.

Two MK 108 guns (100 rpg) were to be fitted in the nose, while two further MK 108s (100 rpg) were planned for each wing root. The designated powerplant was the HeS 011.

Performance calculations for the Me P 1111 single-seat air superiority jet fighter included a top speed of approximately 560 mph (900 km/h) at ground level and about 618 mph (995 km/h) at an altitude of 21,340 ft (7,000 m). According to an postwar Allied CIOS report, the expected range at 32,800 ft. (10,000 m) altitude and a cruising speed of 310 mph (500 km/h) was 923 miles (1,500 km). Its ultimate operational ceiling would have been around 42,700 ft (14,000 m). A pressurized cockpit was therefore essential, with a modern ejection seat as standard equipment. The aircraft's takeoff weight would have been about 9,435 lb. (4,280 kg), the wingspan 28 ft (9.16 m), and the wing area 883 sq.ft. (28 sq.m). Further development of the Me P 1111 was halted when Prof. Messerschmitt decided to give preference to the less radical Me P 1112.

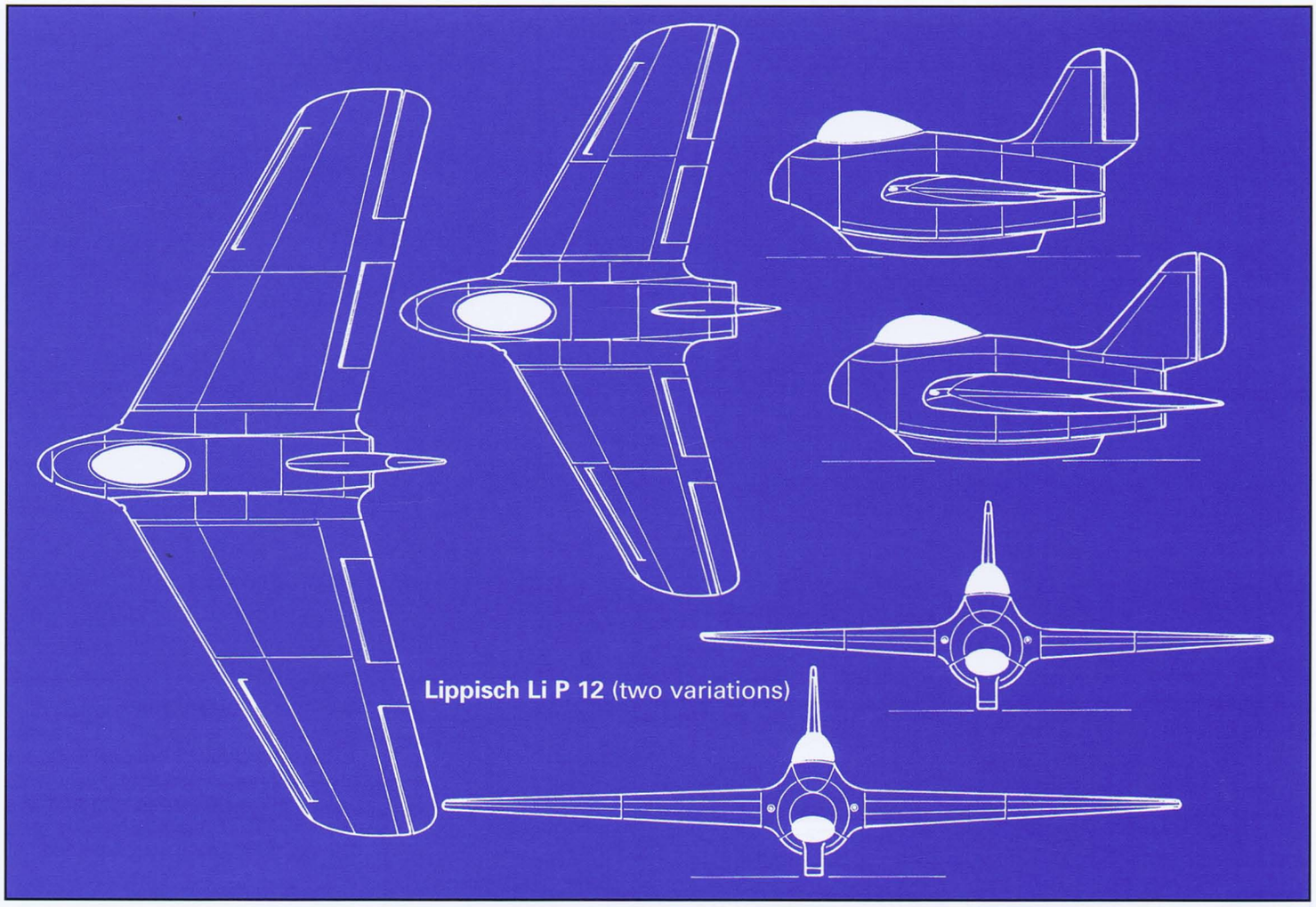
The Me P 1112 was conceived at the end of February 1945, in an effort to correct some of the anticipated shortcomings which had become apparent after analyzing the technical features of the Me P 1110 and P 1111 project studies. The wing area was set at 237 sq ft (22 sq m), since it was discovered that this was the optimum wing loading. The low-drag cockpit was positioned in the extreme nose of the aircraft. Other design features were similar to the two precursors.

On March 3, 1945, Hans Hornung's development group accepted the recommendations of the Sonderkommission Tagjäger (special day fighter committee) to reduce empty weight, thereby possibly increasing fuel capacity by an additional approximately 500 US gal (1,900 liters).

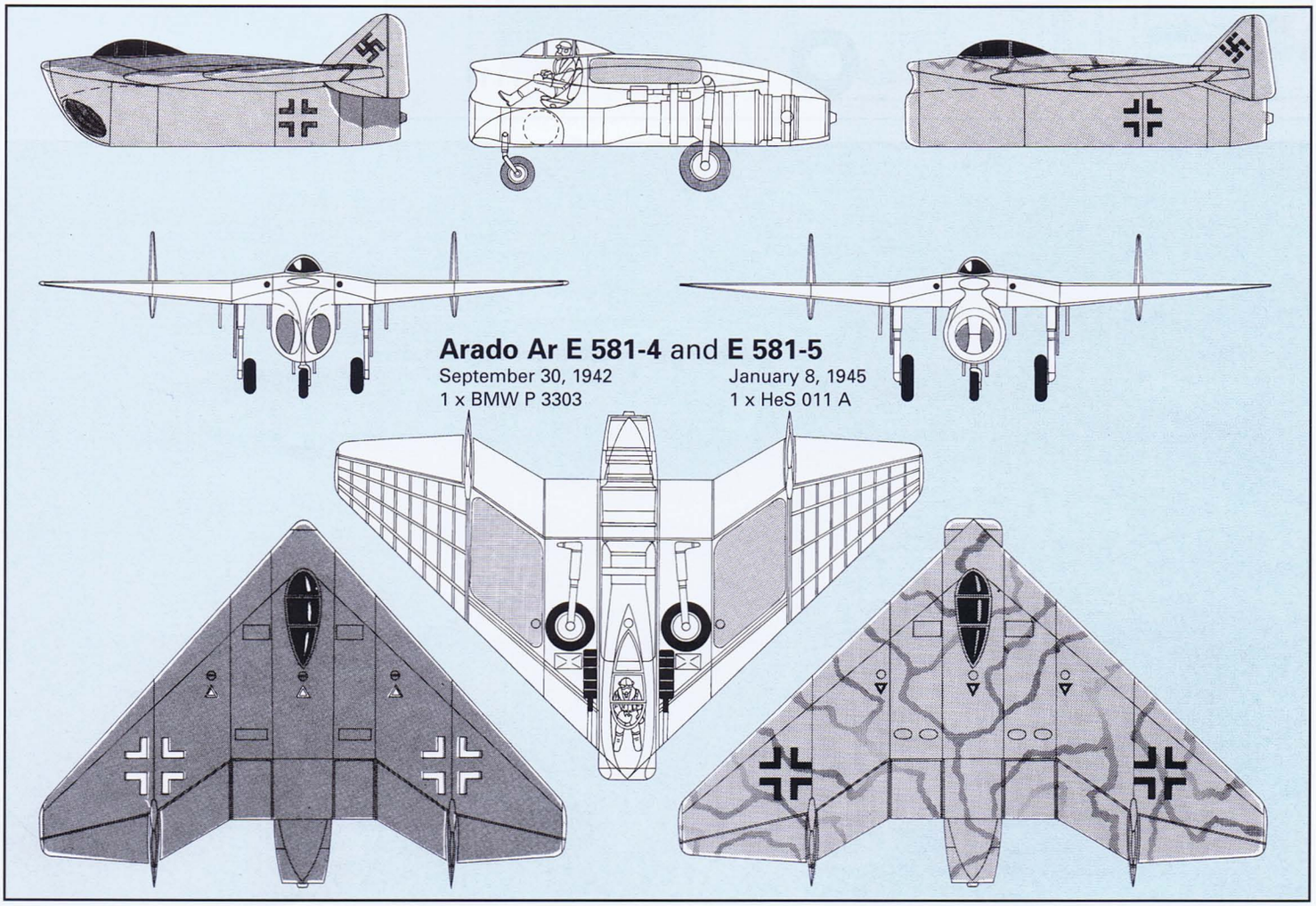
Even though everyone knew by 1945 that the end of the war was in sight, Professor Messerschmitt and his technical director continued working on advanced projects which stood almost no chance of being built. Finally, during February 1945, all work on project studies was suspended with the exception of the Me P 1101 and P 1112. The latter was to become the next advanced fighter design.

Early in March, 1945, two slightly different general arrangement drawings of the Me P 1112 were prepared. The first, the Me P 1112 S/1 (S - Series) was a tailless fighter in which the turbojet air intakes were positioned at about mid-fuselage. The other design, the Me P 1112 S/2 differed by relocated the air-intakes to the wing roots. By March 30, 1945, design work for the Me P 1112 was finalized. The design of the aircraft was now frozen, and instructions were given to proceed first with a wooden, full-size mock-up, while simultaneously cutting metal for the first flying prototype, the Me P 1112 V1. The aircraft now had all the advanced features of the Me P 1101, P 1110, P 1111 and early P 1112 studies.

Messerschmitt Projekt-Ingenieur (project engineer) Bächler accepted responsibility for the development of the proposed armament layout. Working near Oberammergau, at the top-secret Oberbayerische Forschungsanstalt's Building 607, a wooden mockup was under construction by April 18, 1945. Under the designation P 1112 W (W – Waffen / Weapons), the installation of four MK 108s or one 50 mm MK 214, or possibly one 55 mm MK 112, was evaluated on a full-scale mockup.



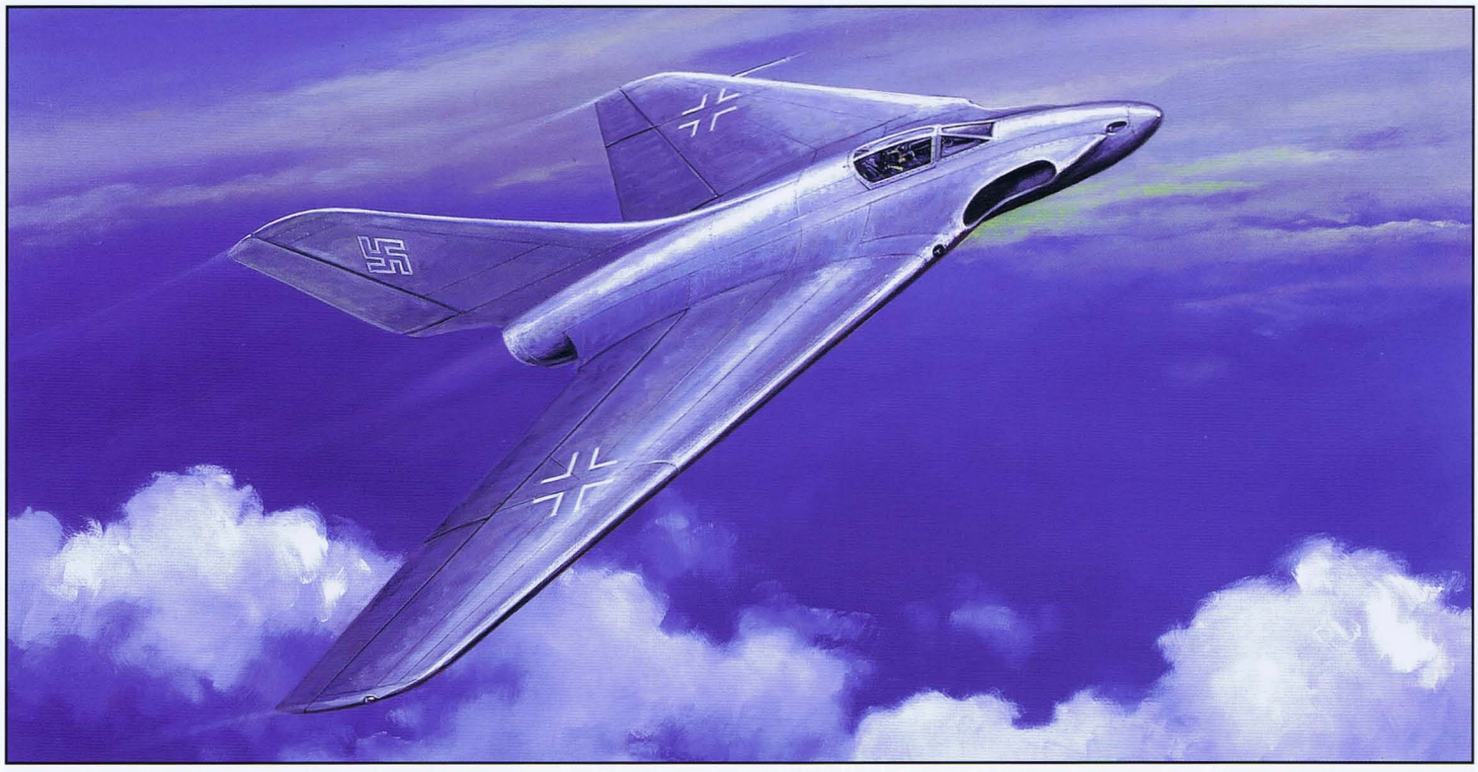
Lippisch Li P 12 (two variations)

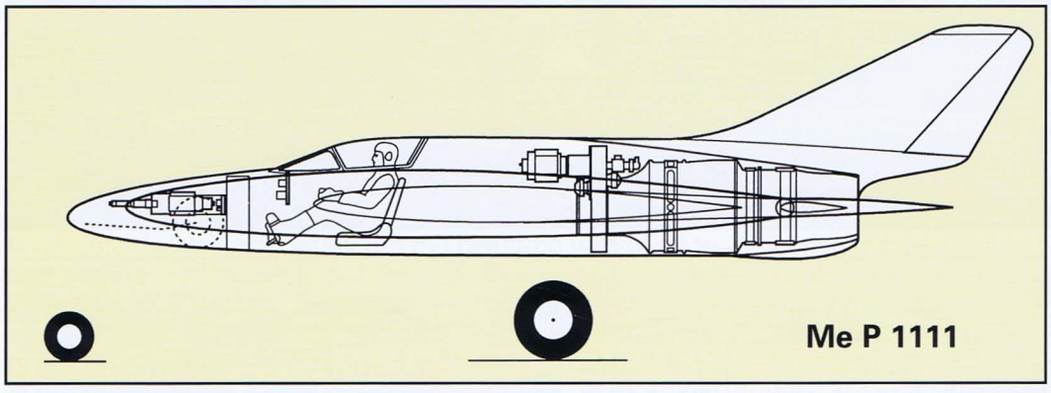


Arado Ar E 581-4 and **E 581-5**

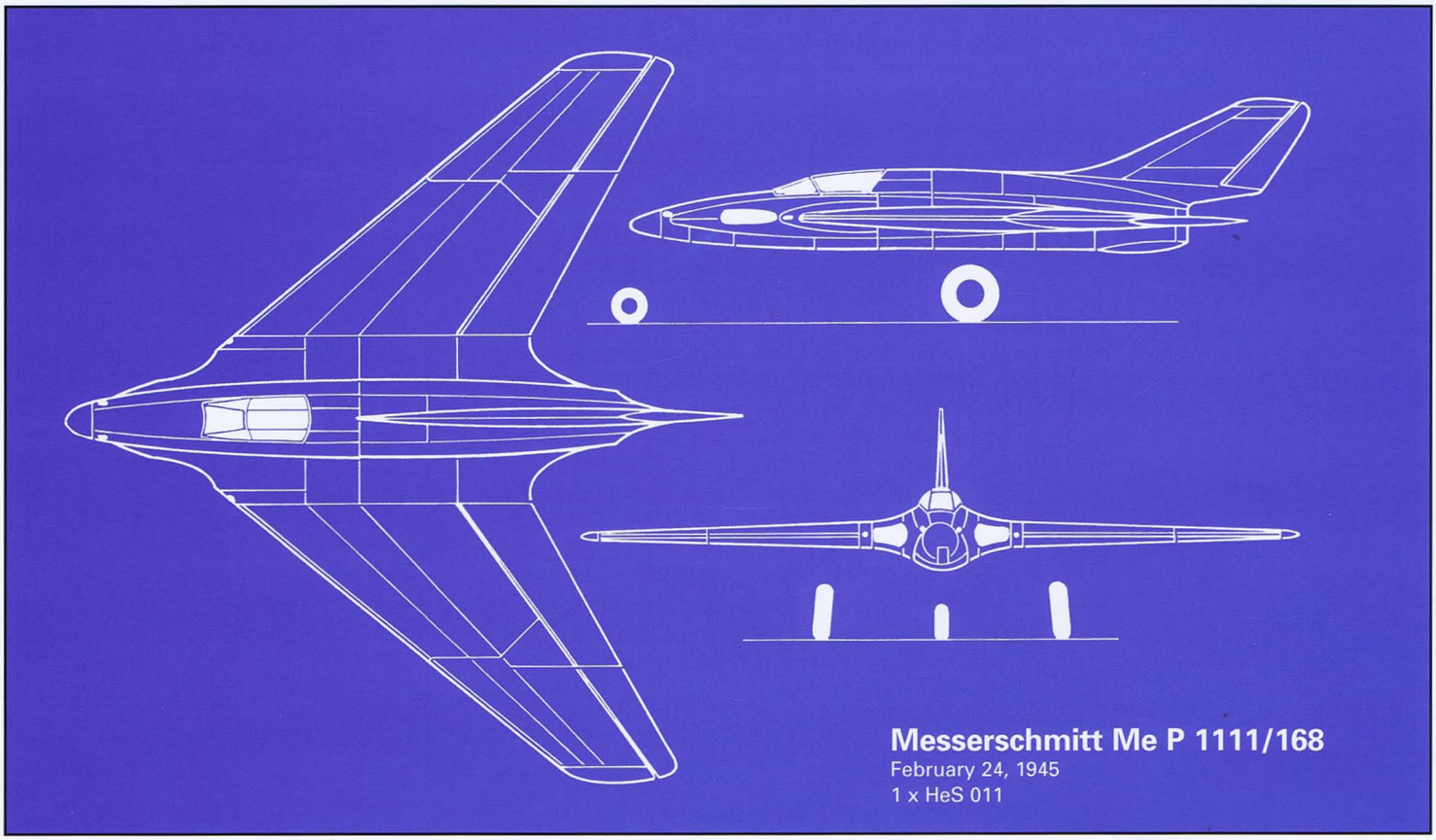
September 30, 1942
1 x BMW P 3303

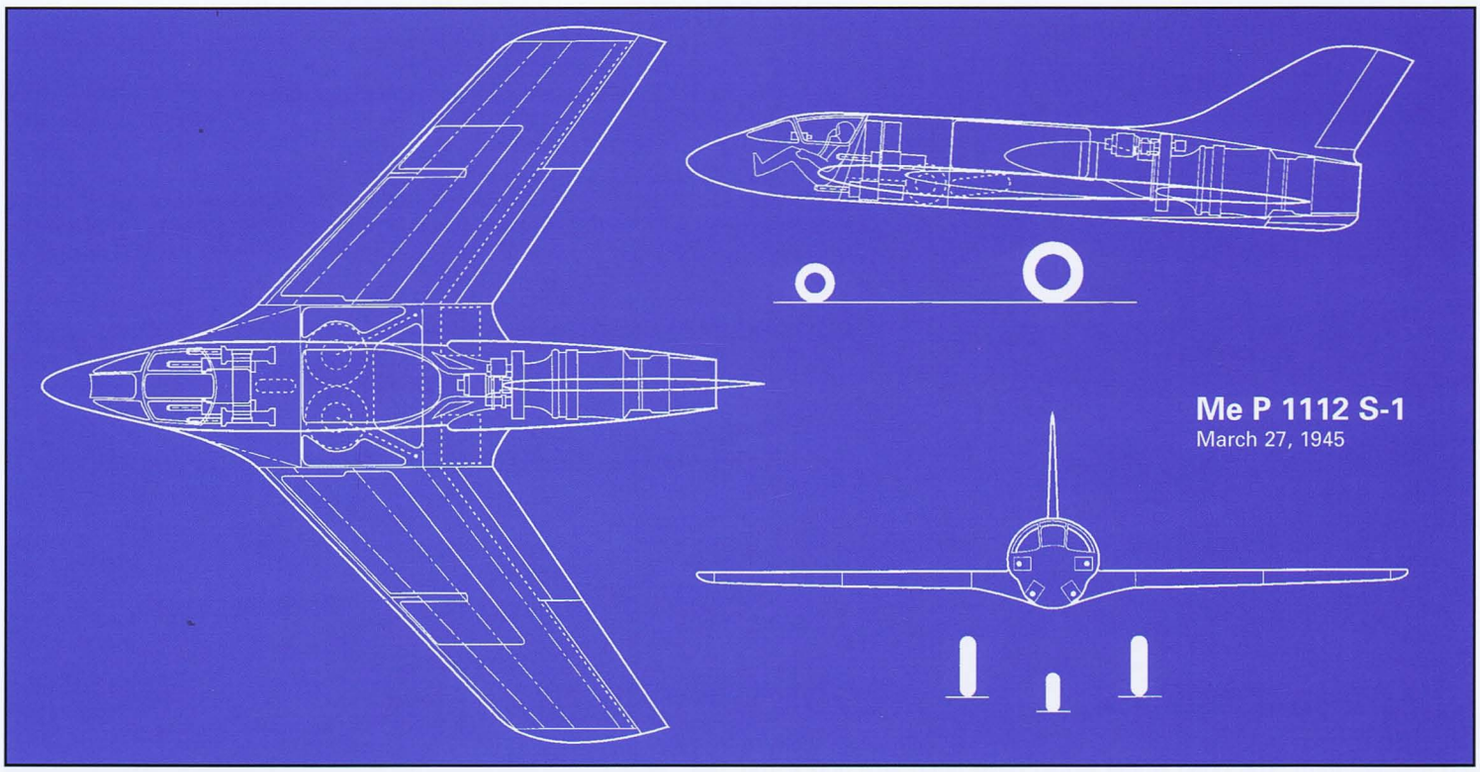
January 8, 1945
1 x HeS 011 A



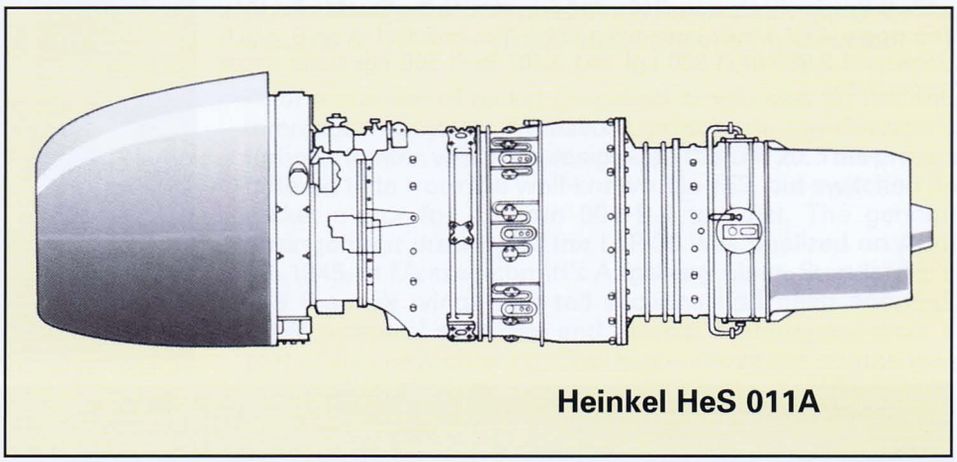


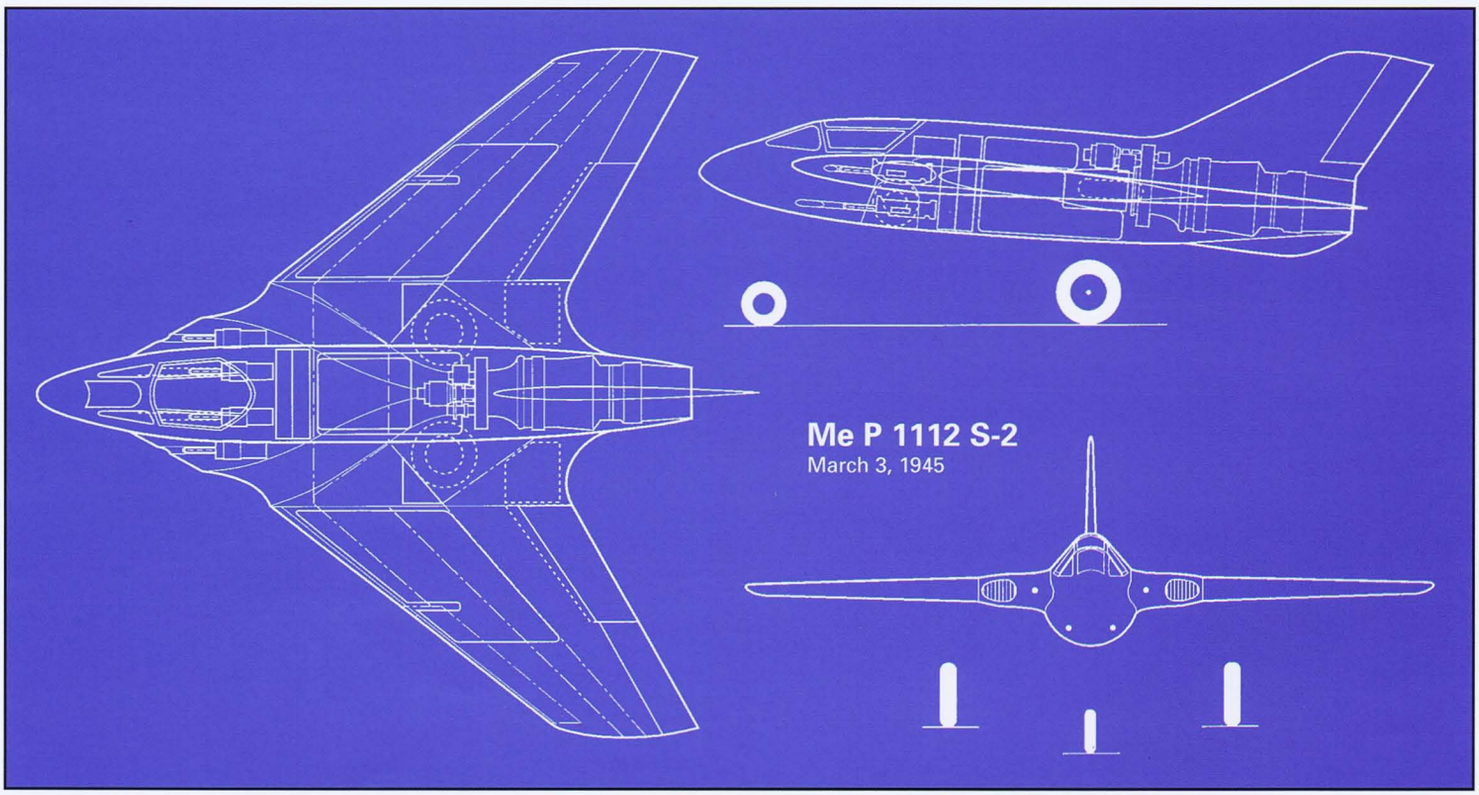
This page: David Pentland's superb illustration of the Me P 1111 is based on drawing XVIII/168, dated February 24, 1945. The tailless fighter was to be powered by a HeS 011 and armed with four MK 108 cannon. A top speed of 618 mph (990 km/h) was expected.

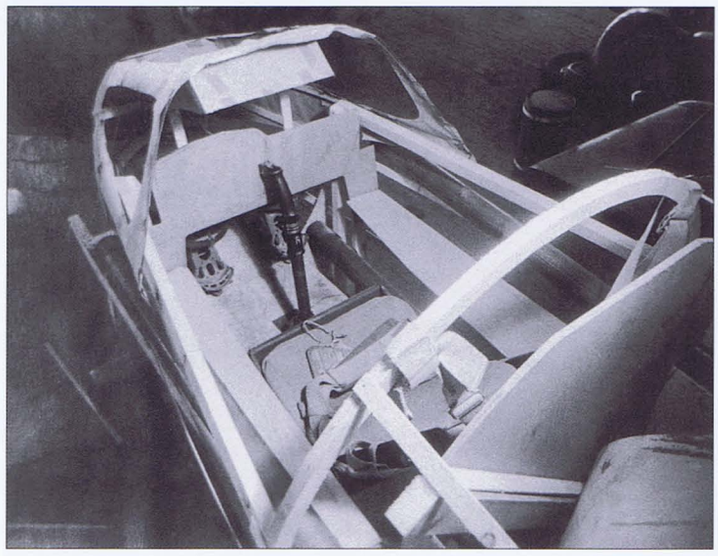




This page: The Me P 1112 as it evolved. The S-1 and S-2 (Series - 1 and - 2) were each designed around a HeS 011 A turbojet (shown right) buried within the rear fuselage. These two design drafts led the way to the final configuration shown overleaf.

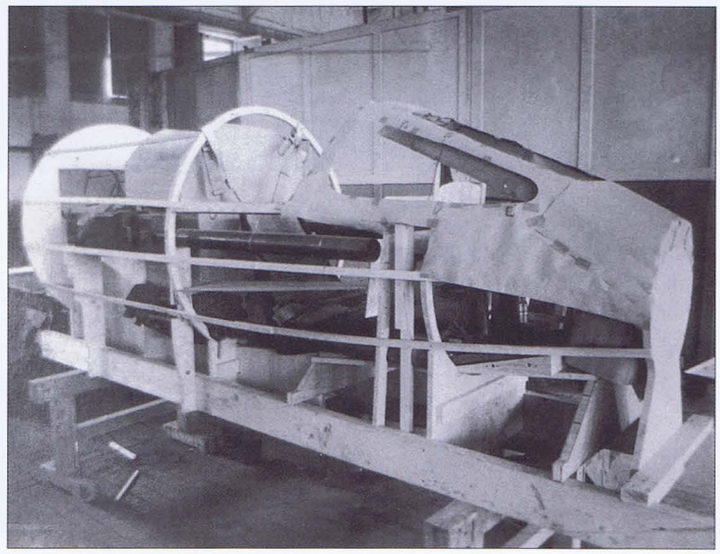


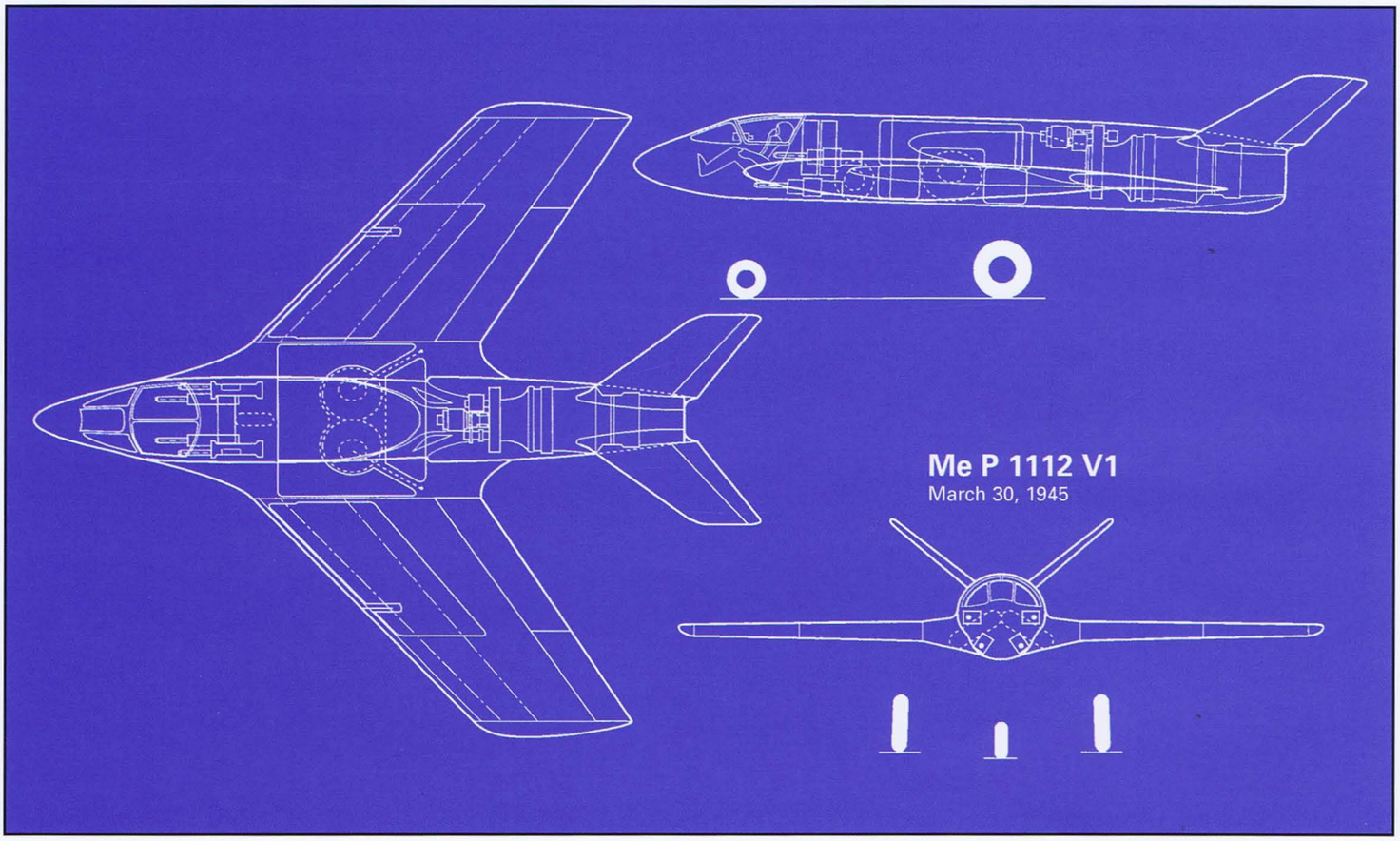


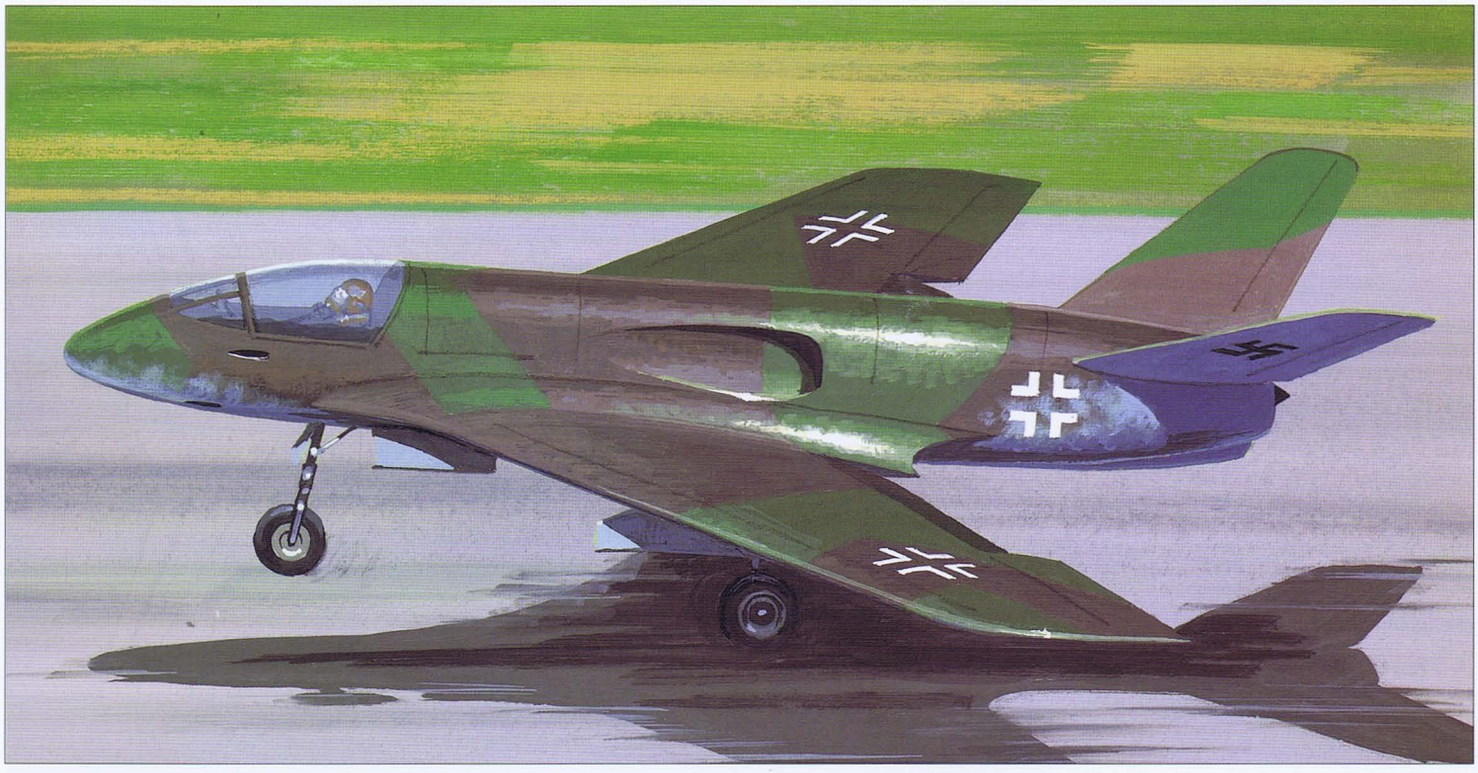


Left and below: The incomplete wooden mock-up of the nose section and cockpit Me P 1112 V1 as it was discovered when American troops occupied Oberammergau in April 1945. This design, dating from March 30, 1945, reflected the final arrangement of the Me P 1112 before metal was cut for prototype construction. The tailless approach as represented in drawing XVIII/156 (February 25, 1945) [not shown], XVIII/157 (March 27, 1945) [S-1] and XVIII/167 (March 3, 1945) [S-2], was abandoned in favor of a conventional layout (shown at bottom) with a butterfly tail. Note the asymmetric cockpit layout in which the pilot and flight instruments would have been offset to port. The reason behind this configuration rests with the planned armament for the Me P 1112. Three arrangements were planned. The first consisted of four 30 mm MK 108 cannon disposed evenly about a symmetrical cabin as shown in the 3-view below. The second scheme called for a large 50 mm MK 214 cannon to be mounted asymmetrically on the starboard side of the cabin...thus necessitating the asymmetric seating. The third weapon scheme involved the 55 mm MK 112 that was to be positioned low on the starboard side below the MK 214.

The Mauser MK 214 appeared too late to see operational service but was successfully flight tested in the Me 262 A-1a/U4 (see p. 64). The Rheinmetall-Borsig MK 112 also appeared too late with only ten examples constructed before the end of the war. The Me P 1112 V1 would have had a wing span of 26.7 ft (8160 mm), an overall length of 30. 3 ft (9240 mm) a height of 9.3 ft (2840 mm) and a wheel track of 8.3 ft (2540 mm). The nose wheel would have been size 500 x 180 while the mainwheels were 740 x 210 (identical to the final Me P 1101). The powerplant would have been either the HeS 011 A or B which developed 2,866 lb (1,300 kg) and 3,307 lb (1,500 kg) static thrust respectively.







Above: Under the leadership of Woldermar Voigt, Messerschmitt's chief engineer at Oberammergau, the Me P 1112 would have undoubtedly matured into a very potent fighter, providing its engine and weapons proved reliable enough for service use.

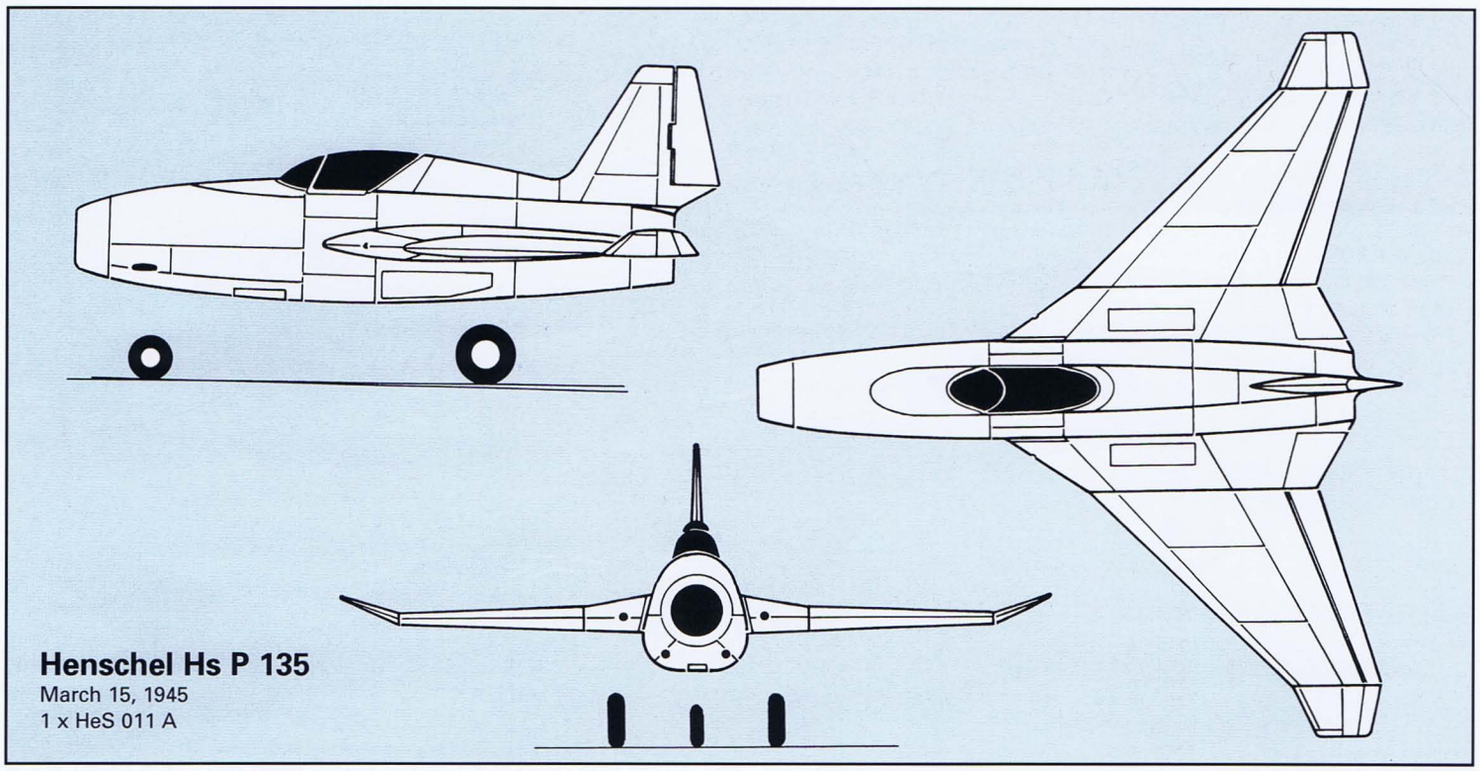
Between January and March, 1945, the P 1112's expected performance was compared with that of its predecessors, in addition to two projects outside the Messerschmitt firm, the Junkers EF 128 and the Focke-Wulf Ta 183. As the outcome of the last fighter design competition confirmed, the risks in realizing these projects were similar. The Me P 1110 would possibly have been the most promising design. Incredibly, the Deutsche Versuchsanstalt für Luftfahrt was unable to select a winner from the proposals submitted for the competition, and continued to solicit new designs as late as the first week of April, 1945! Only the final assembly of the Me P 1101 V1 was ordered by the Chef TLR and the Reichsforschungsführung (Reich Research Authority).

Only one advanced Henschel jet fighter project, the Hs P 135, was developed at their Schönefeld facility during 1945. The Hs P 135 was a single-seat flying-wing project, to be powered by a single HeS 011 A-1 turbojet. Proposed armament for this interesting fighter consisted of two or four MK 108s in the front fuselage, above and below the long intake duct, plus an additional two in the wing roots. The Hs P 135s nosewheel would have retracted into the lower fuselage, rotating to lie flat in the wheel bay. The mainwheels retracted forward into the fuselage. Dipl.-Ing. Fr. Nicolaus stated to Allied interrogators that fuel capacity would have been about 3,530 lb. (1,600 kg). Takeoff weight was about 12,125 lb. (5,500 kg), wing span about 28 ft (9.2 m), and wing area about 221 sq ft (20.5 sq m). As there was no hope of obtaining Heinkel turbojets, in early 1945 Dipl.-Ing. Nicolaus decided to have the Hs P 135 modified for the Walter HWK 509C rocket engine, with two combustion chambers. This project was given the new designation Hs P 136.

The Li P 15, code named Diana, was another of the desperate attempts evolved in March, 1945, to develop a powerful single-seat fighter heavily based on the Me 163 rocket interceptor. Quantities of sub-assemblies from Me 163 production had, in the meantime, been in storage since the autumn of 1944, when Me 163 production was halted.

After a number of rocket-propelled, single-seat fighter and interceptor projects, Professor Lippisch tried to develop a turbojet fighter, which he designated the Li P 20. This project differed little from the well-known Me 163, but switched its rocket motor for a Jumo 004 B-1 turbojet. The general arrangement drawing of the Li P 20 was finalized on April 16, 1945, at Messerschmitt's Augsburg plant. Standard Me 163 B-series wings and tail sections had been adopted, while a central air-intake and tricycle landing gear were a part of this new creation. The space above the engine was reserved for fuel storage, in addition to additional tanks found in the wings. The heavy armament consisted of two MK 103s in the wing roots and two MK 108s on either side of the heavily armored cockpit. The mainwheels retracted into the wings, while the nosewheel turned and moved backwards into a well below the Jumo turbojet. The design was not approved by the RLM and no further work was spent on its development.

The Horten brothers were well known for their successful all-wing sailplane designs, which appeared before the outbreak of war. Less well known were their ideas on jet-powered military aircraft. One example is the H X (sometimes referred to as the Ho X, or Ho 10), which evolved during the second half of 1944 as an entry into the field of supersonic light-weight fighters powered by a single HeS 011. Two variants were evolved: the H X-A, featuring a prone pilot with the jet engine mounted above the center section; and the H X-B, which differed only by the engine having been relocated to a space within the center section. Neither version used any form of vertical tailplane. Because of its simple construction, the H X-B was thought to be perfect for the Volksjäger competition. It was one of a group of light-weight fighter projects to be powered by a single turbojet and armed with two or three forward-firing cannon. With a wing span of 4.9 ft (14,00 m) and a length of 23.6 ft (7,20 m), the H X featured a 45-degree sweptback wing fitted to a center section housing the prone pilot, armament and an aft- positioned turbojet. Since the HeS 011 was not ready for service use, and since the RLM ultimately favored the



Henschel Hs P 135
March 15, 1945
1 x HeS 011 A

Heinkel entry for the Volksjäger, the H X remained simply an interesting project.

Apart from the preceding single-engine, flying-wing fighter designs, others projects were to be powered by two turbojets.

Among these was a project evolved by Dr. Lippisch identified as the Li P 01-112 Strahljäger mit zwei BMW P 3302 TL, which was finished on January 31, 1940. It had its two turbojets buried side-by-side in the center fuselage. Two fuel compartments were located behind the pilot and on top of the turbojet engines. Air-intake scoops were placed on either side of the cockpit and the aircraft was to use a jettisonable takeoff dolly. Landing was to be accomplished with the help of a centrally mounted retractable ski, plus a small tail skid.

The Lippisch Li P 09 Strahljäger project of 1941 also belonged to the early twin-jet, flying-wing family of projects. It resembled an enlarged Me 163 with two turbojet units fitted in the wing roots. The wingspan measured 35.4 ft (11,60 m), with a total length of 21.6 ft (7,10 m). The aircraft was designed with a tricycle undercarriage and the proposed armament would have consisted of two MK 103s plus two MG 151/20s installed in the lower forward fuselage.

During the prewar period, the firm of Gothaer Waggonfabrik AG of Gotha, under the leadership of Dr. August Kupper, evolved several all-wing aircraft designs, including the Go 147 of 1934. This tailless fighter design was notable in employing vertical surfaces positioned at the wing tips. The Go 147 was not particularly successful, but even after the death of Dr. Kupper, Gotha officials continued to experiment with tailless aircraft. In the early 1940s, Dr. Rudolf Göthert, formerly with the DVL, joined the Gotha firm to head its design section for tailless and all-wing aircraft. In 1942, Göthert began work on a turbojet all-wing fighter. Working concurrently at Göttingen, the Horten brothers and their aircraft were already well known to Dr. Göthert and his associates. By 1943, the Horten brothers were seeking a firm with the manufacturing capacity to build a number of their own all-wing H IX and, with RLM approval, approached Gotha. This relationship proved successful, as we shall discuss later. In the meantime, Dr. Göthert, having worked on two advanced flying-wing projects, the Gotha Go P 52 and the P 53, began investigating the feasibility of combining certain features of the Horten H IX and the Go P 58 fuel-carrying glider into an impressive new twin-engined turbojet design, designated Go P 60.

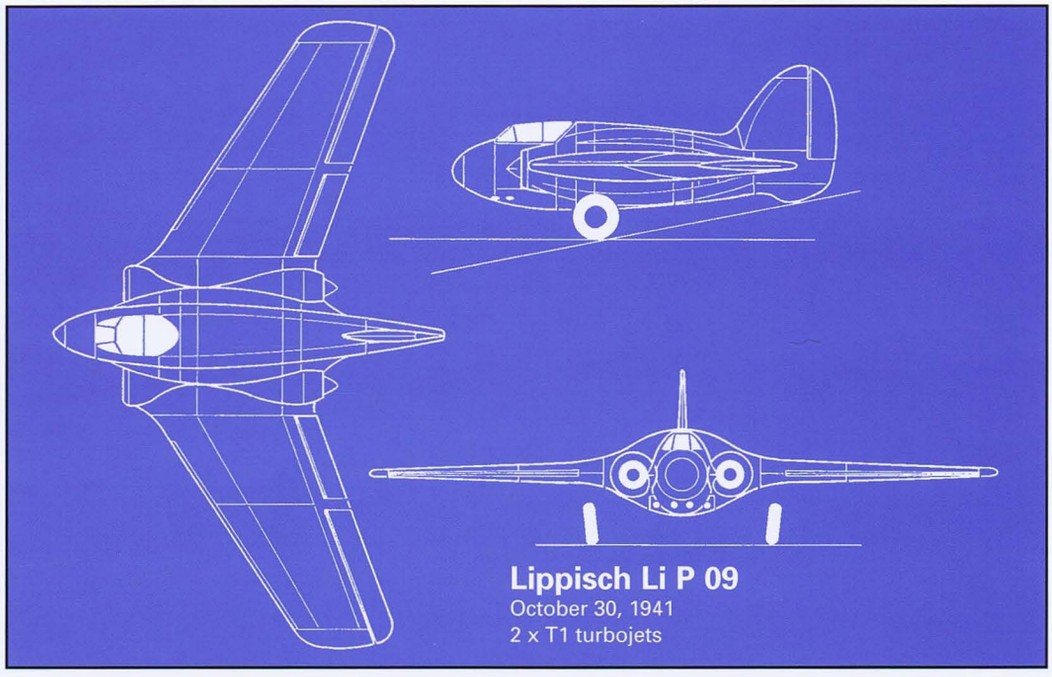
Three versions of the Go P 60 were set forth. The Go P 60 A was a prone-positioned, two-man fighter design to be powered by two BMW 003 turbojets. The Go P 60 B was slightly larger and powered by two HeS 011 jet engines. The third model, the Go P 60 C, was a proposed night fighter (see chapter covering night fighters in volume 2), which differed considerably.

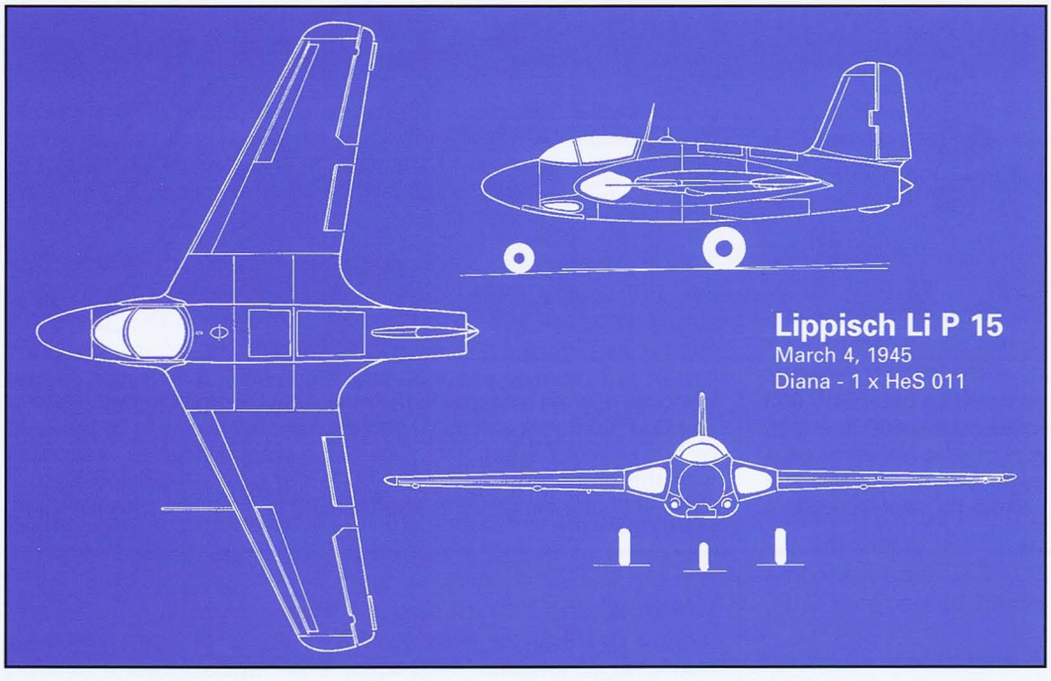
On January 1,1945, Gothaer Waggonfabrik AG compared its initial P 60 designs with Horten's Ho 229 (as the H IX was now officially identified). In spite of the high degree of cordiality which existed between the Horten brothers and the staff of Gotha, Dr. Göthert was convinced that the Horten brothers' jet fighter, the Ho 229, was not ready for series production. Moreover, the Gotha engineers had serious doubts that the Ho 229 would ever perform its mission to the degree of reliability demanded by the Luftwaffe. On January 27, 1945, Gotha released its definitive report comparing the Ho 229 V6 (second prototype for the Ho 229 A-1)[13] with their Go P 60. The results of this report strongly suggested the P 60 offered better handling and performance characteristics in most categories other than high speed stability (due to the 45 degrees of sweepback compared to the 28 degrees of sweptback on the Ho 229). Nevertheless, the RLM instructed Gotha to proceed with production preparations for the Horten jet. The Horten brothers had friends in high places within the Air Ministry!

Three different projects, evolved before March 11, 1945, were investigated. The first design, which was intended to replace the Ho 229 jet-propelled flying wing, was the Go P 60A Deltajäger mit BMW 003 A (delta-wing fighter with BMW 003 A), or alternatively two Jumo 004s. The two jet engines were to be mounted on top of each other, above

13 In point of fact, the Ho 229 V6 itself was still under construction and never completed.

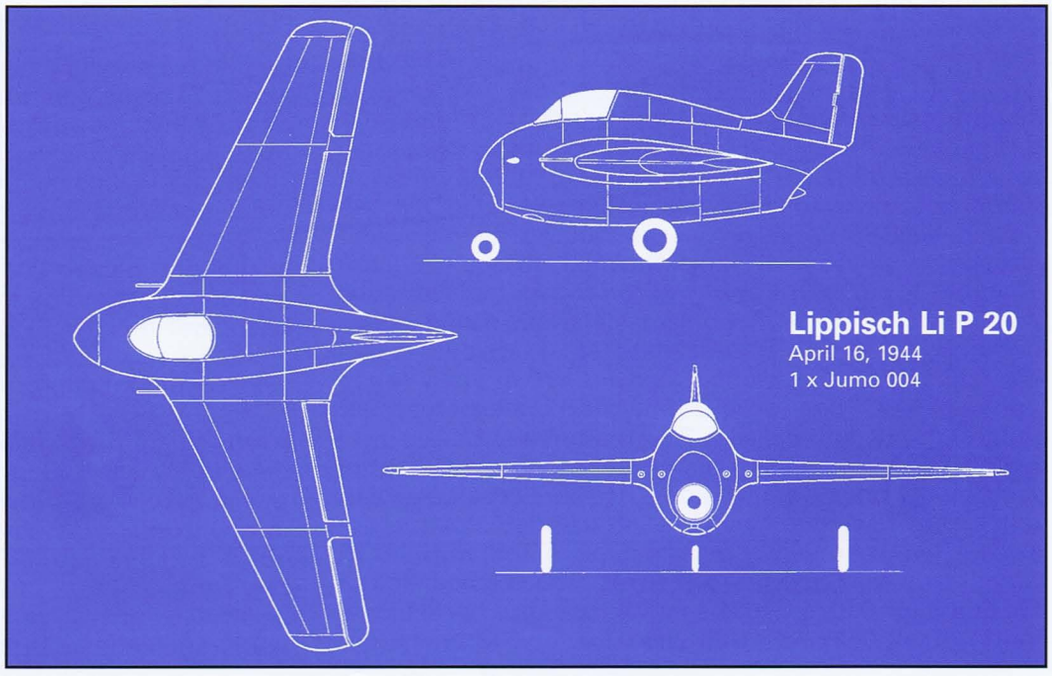
Left opposite: The tailless Hs P 135 was designed early in 1945 as a single-seat, single-engine jet fighter powered by a HeS 011 A turbojet. The unusual dihedral wing tips were intended to add an extra measure of stability during low speed flight. **Right:** The Li P 09 was an early 1941 twin-engined tailless fighter design featuring mainwheels which retracted aft and outboard into the wings while the conventional tail wheel was replaced by a fixed tail skid.

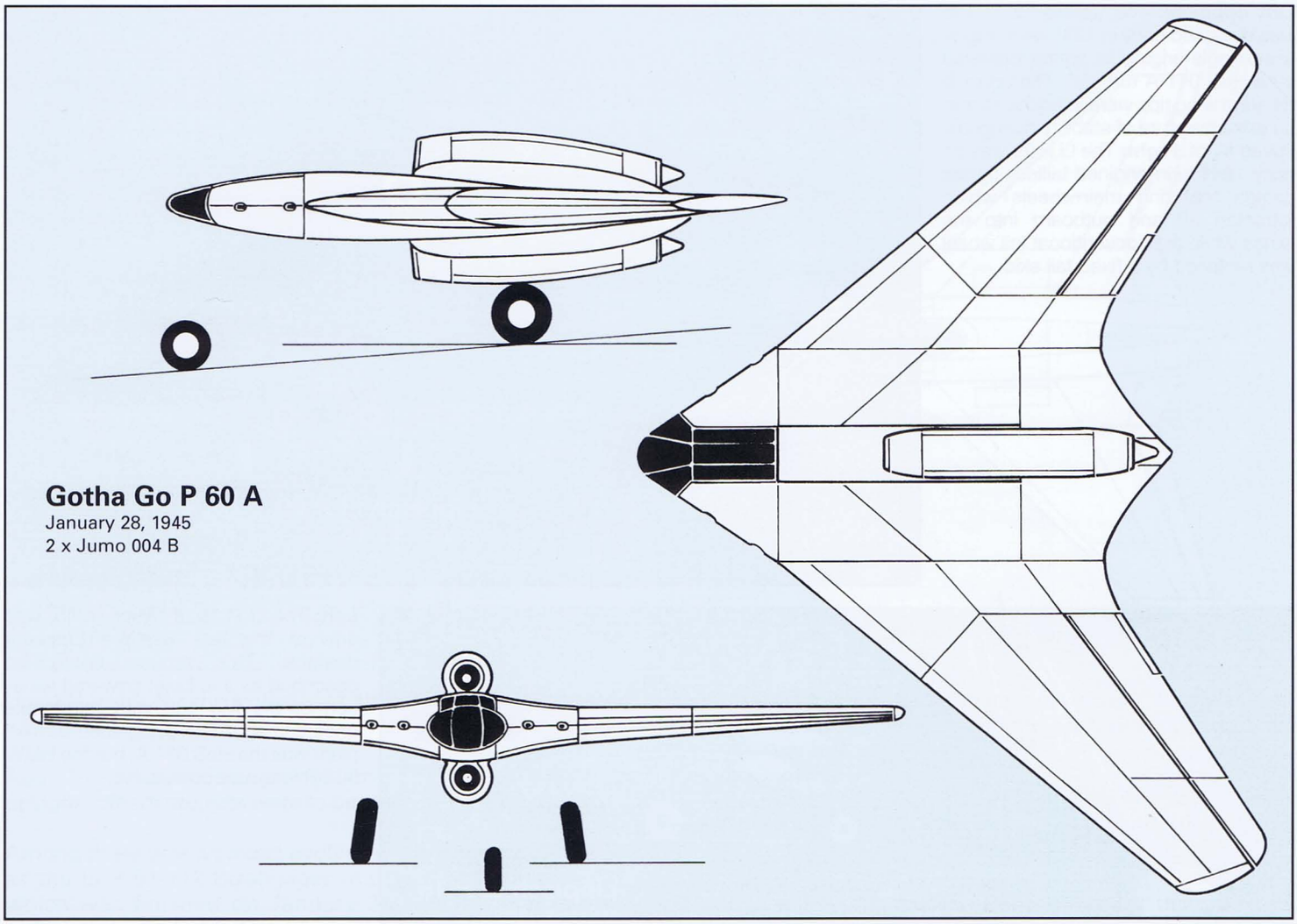




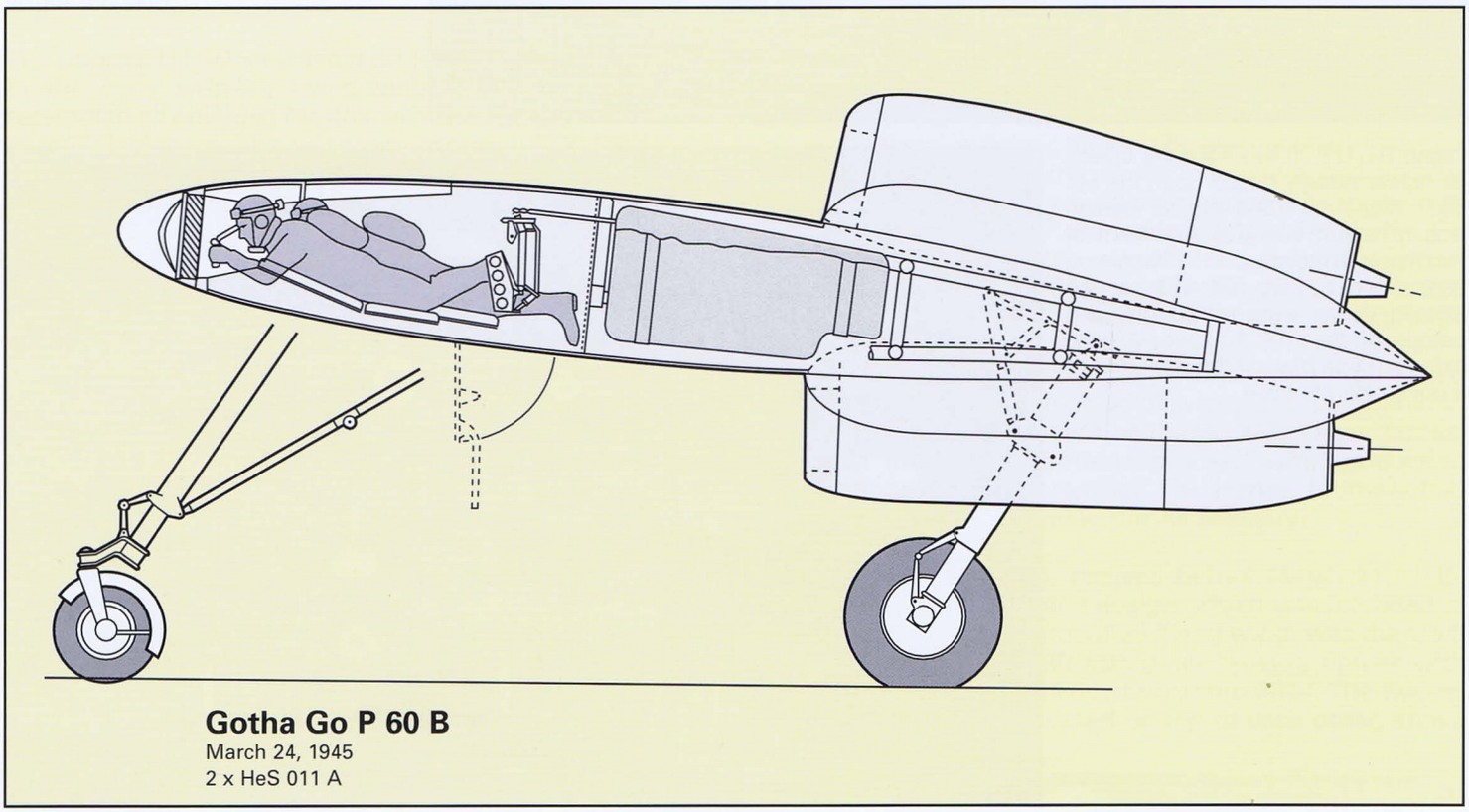
Left: The Li P 15 of March 1945, was one of the last wartime Lippisch designs. This project could be described as a turbojet powered variation of the Me 163 with retractable undercarriage. The designated power-plant was the HeS 011 A, but the BMW 003 R was also considered.

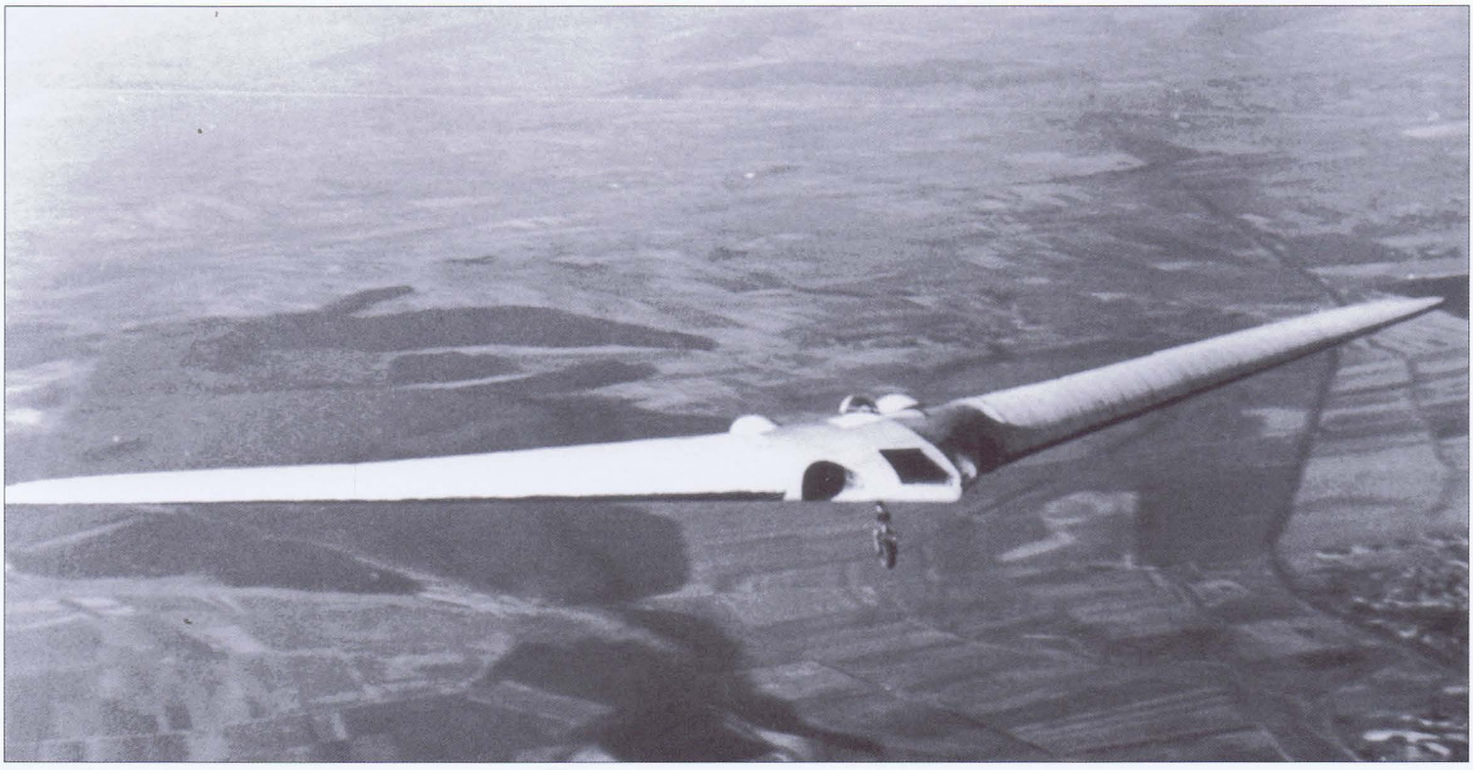
Right: The Li P 20 was a another tailless jet fighter heavily based upon the Me 163. This April 1943 project design was to feature a heavy armament of two fuselage mounted MK 108 cannon augmented by two MK 103 cannon located in the wing roots. The long barrels of the MK 103 would have extended well beyond the wing root to a point near the nose.





Above: The Gotha Go P 60 A was to be powered by two BMW 003 A turbojets that could have been augmented by a 4,400 lb (1,995 kg) static thrust rocket motor. The prone pilot and observer were positioned in the nose and a proposed armament of four MK 108 cannon would have been contained in aircraft's center section. Because of crew placement, the nosewheel is offset to port. **Below:** The Go P 60 B was a slightly enlarged version that was to be powered by two HeS 011 A turbojets. One of the great difficulties associated with the prone pilot arrangement, is the pilot's restricted field of view. In fighter aircraft, this shortcoming is a definite disadvantage.





Above: In order to test the basic design of the Horten 9 (also known by the Roman numeral IX), the Horten brothers modified their Ho 2 (Ho II), D-10-125, sailplane to resemble the proposed jet powered flying wing. The aircraft is shown here being tested in flight.

and below the center fuselage. Pilot and observer lay prone, side-by-side. This arrangement permitted an extremely clean design, since there was no projecting cockpit canopy. To provide space for the crew, the nose-wheel was offset. The mainwheels were stowed flat in the wings, which also contained the main fuel tanks. The offensive armament would have been comprised of four MK 108s mounted in pairs on each side of the cockpit. In addition to the turbojets, it was thought that the use of a Walter rocket engine of 4,400 lb. (2,000 kg) thrust would improve takeoff, climb and combat performance.

The wing of about 504 sq ft (46.8 sq.m) had one degree of dihedral and 45-degrees sweepback at quarter chord. Special leading edge flaps were fitted initially to improve stall characteristics.

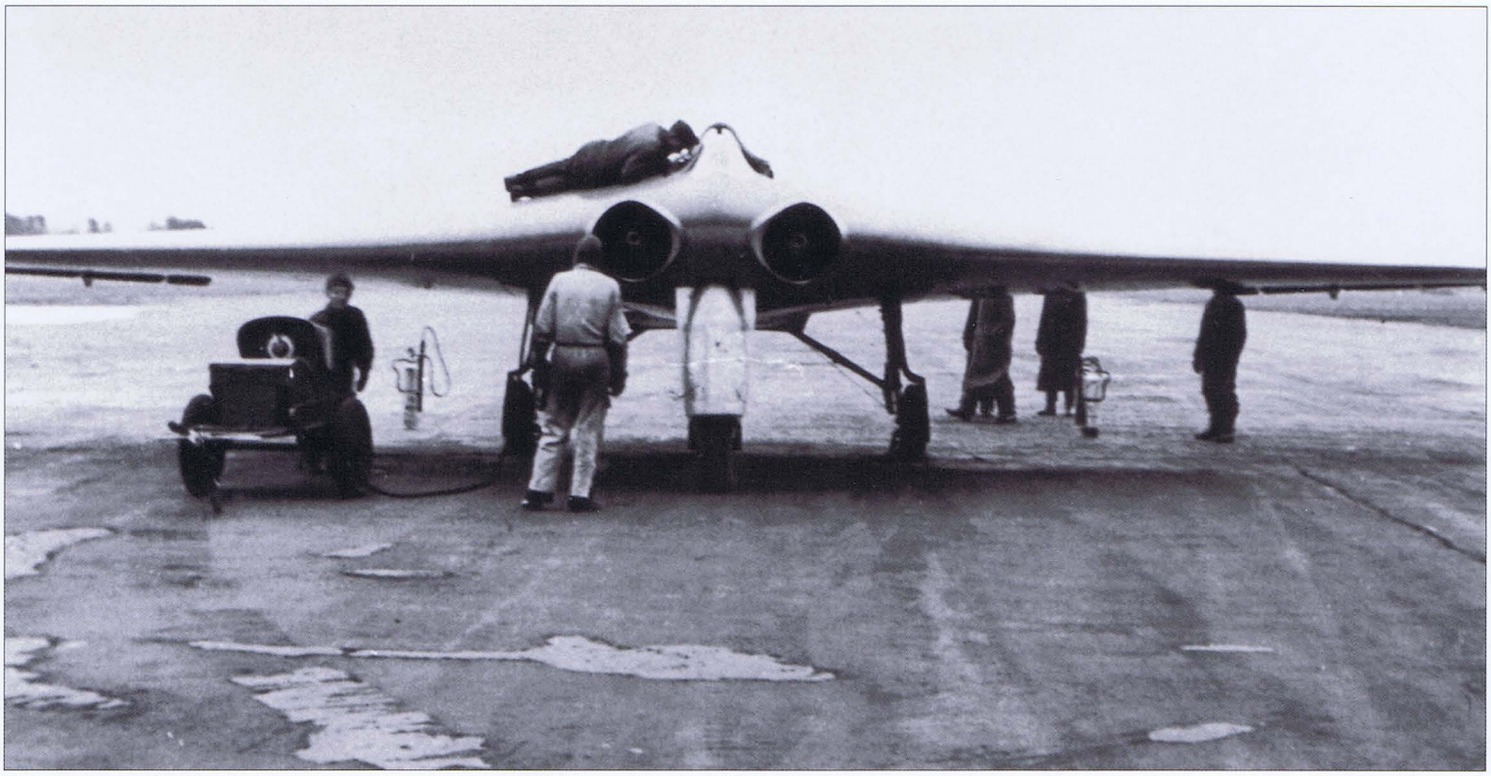
For directional control, narrow chord airfoils were mounted close to the wing tips at a predetermined angle of attack. They could be retracted to lie flat in the wing when not in use. The elevons (combined elevators and ailerons) were split. At high speed, only the outer parts were used, while at low speed, the inner servo-tab operated surfaces were also employed. The leading particulars and estimated performance were as follows: at 100 percent thrust, the P 60 A would have had a range of 995 miles (1,600 km) compared to the Ho 229's 870 miles (1,400 km) Top speed was calculated at 587 mph (945 km/h) at 19,700 ft (6,000 m), while the climb rate differed little from that of the Ho 229.

The enlarged Gotha Go P 60 B Deltajäger mit HeS 011A was developed from the P 60 A. It had an increased wing area of about 589 sq ft (54.7 sq m), while the wingspan was increased from 40.6 ft (12,4 m) to 44.3 ft (13,5 m). It was to be powered by two Heinkel-Hirth turbojet engines. A top speed of 609 mph (980 km/h) at 26,250 ft (8,000 m) was expected. Advanced HeS 011B engines were to be installed at a later date. Surviving manufacturers' drawings of the P 60 B show an aircraft very similar to the version A. Seating and armament were the same, but flying characteristics of the P 60 B were expected to be superior due to the use of leading-edge flaps.

The Go P 60 B was expected to be equipped with an auxiliary rocket engine. The enlarged airframe resulted in an increased takeoff weight of 24,250 lb. (11,000 kg). Performance calculations drawn up in March, 1945, showed a climb rate of 30 ft/sec (9,5 m/s) at about 48,400 ft (14,750 m), while range was estimated at more than 932 miles (1,400 km), and endurance at 2.43 hours. With rocket assistance, an altitude of 32,800 ft (10,000 m) was reached in 2.6 minutes. If the rocket motor was cut at 11,500 ft (3,500 m), total climb to 42,540 ft (13.000 m) was 5.8 minutes. If the auxiliary rocket was used up to an altitude of about 28,000 ft (8,500 m), a ceiling of 52,500 ft (16,000 m) could be reached in only 9.5 minutes.

An additional tailless concept designed by Messerschmitt at the Oberbayerische Forschungsanstalt and known as the Me Schwalbe (Swallow) was still incomplete by the end of the war.

In spite of the fact that only two prototypes were actually completed and flown, the Horten brothers' all-wing, jet-powered fighter, initially known as the H IX, was high on the list of fighters officially sanctioned for continued development, production and even operational deployment to a specific Luftwaffe unit. None of this would likely have resulted, had it not been for a number of fortuitous events which ultimately positioned the brothers within the higher circles of the Luftwaffe. The H IX development began early in 1943, when the Horten brothers first met Reichsmarschall Hermann Göring and Oberstleutnant i.G.(Lt. Col.) Diesing at the Reichsjägerhof (Reich hunting lodge) on September 28, 1943. Having shown Reichsmarschall Göring some photographs, 30-year old Hauptmann (Captain) Walter Horten outlined the evolution of the new fighter by his team, which included Messrs. Kaupa and Peschke. He indicated the new fast fighter would also be able to carry a 2,200 lb. (1,000 kg) bomb at a top speed of approximately 590 mph (950 km/h). When



Reimer and Walter Horten received 500,000 RM and government approval for their project, which now had received the official RLM GL/C number 229, the future of the H IX appeared assured.

As planned, the unpowered Horten Ho 229 V1 was towed into the air at Göttingen by an He 45 on March 1, 1944, with Lt. Heinz Scheidhauer at the controls. Later, a larger twin-engined He 111 took over the task of towing from the small He 45. Meanwhile, work progressed on the first powered prototype, the Ho 229 V2, until it was realized that the promised BMW 003 would not be ready. Accordingly, the decision was made to modify the design to allow for the installation of two larger Jumo 004 turbojets. When the first Jumo 004B units were delivered, the Horten brothers were astonished to learn that their diameter turned out to be nearly 8 inches (20 cm) greater than anticipated. The design had to be modified once again. The wingspan was increased from 52.98 ft. (16.1 m) to 69.9 ft. (21.3 m) in order to improve the aerodynamic qualities of the flying wing.

On June 26, 1944, Luftwaffenkommando IX began construction of the redesigned and improved Ho 229 V3, as well as additional test aircraft began at a small Fliegerhorst (air base) near the city of Göttingen. The technicians worked long hours,often putting in more than ninety hours per week, in an effort to finalize the installation of the turbojets.

Meanwhile, on July 7, 1944, the Deutsche Versuchsanstalt für Luftfahrt (DVL) at Berlin-Adlershof had finished flight testing the Ho 229 V1. Flight testing was not entirely satisfactory due to the aircraft's excessive yaw (side-to-side movement), but overall, control surfaces were considered to be sufficient.

Two months later, the list of equipment for the full-scale mockup was compiled by Oberleutnant Brüning (Dept. E 2, Rechlin), Brüne (Horten), Hühnerjäger (Gotha), and some other experts. The production Ho 229 was supposed to have been equipped with FuG 25a, FuG 16ZY, and FuG 125 avionics. It was also planned to fit two or four forward-firing fixed weapons as well as reconnaissance equipment comprising an Rb 50/30 or Rb 75/30 aerial camera.

Above: The Ho 229 V2, W.Nr. 39, being readied for its first flight in December 1944. Because the pilot, Lt. Erwin Ziller, was unfamiliar with the finer points of the engines, a Junkers technician is shown laying across the starboard Jumo 004 while instructing Ziller how to successfully start the engines. **Opposite:** Arthur Bentley's precision drawings of the third prototype, the Ho 229 V3.

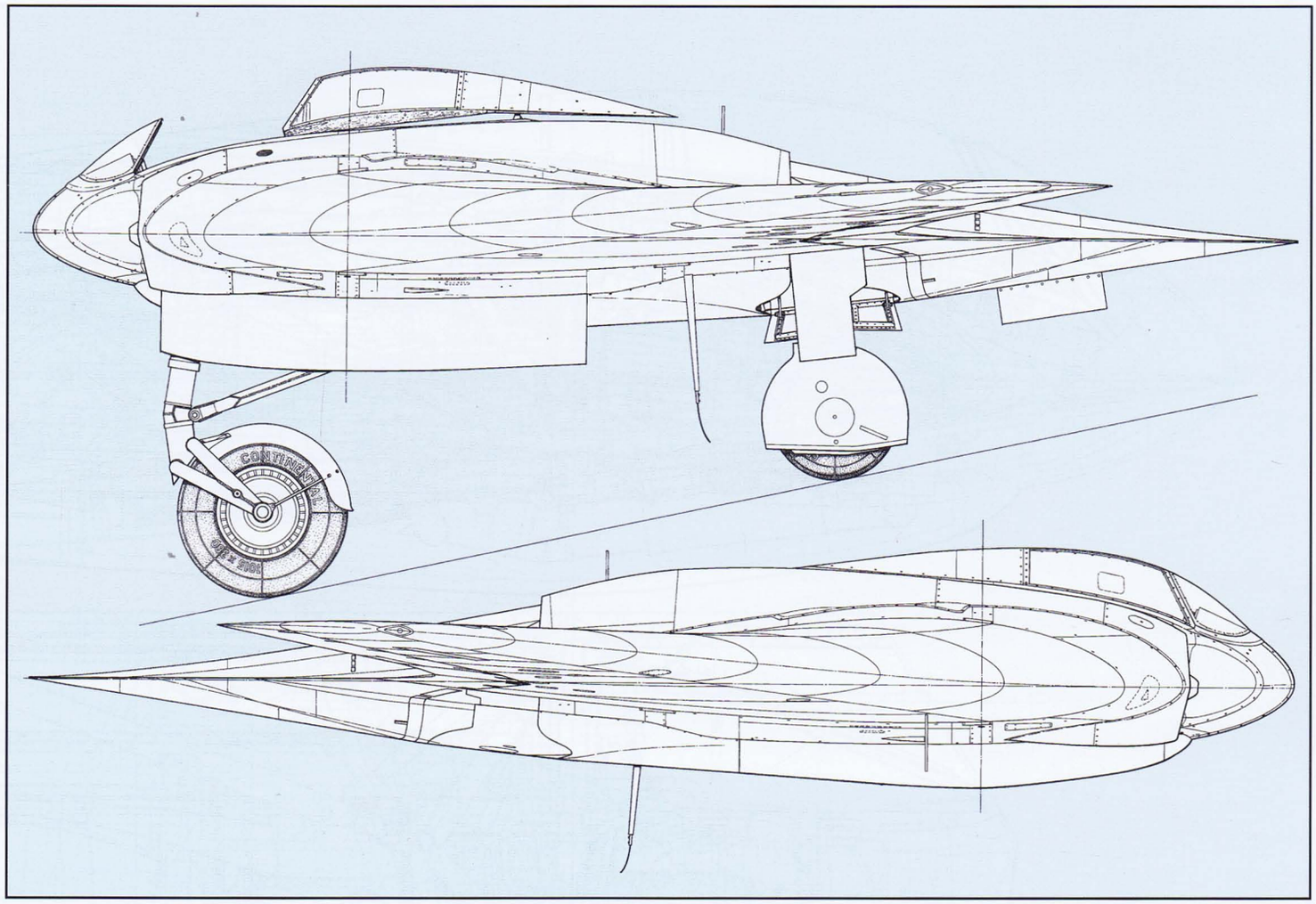
The first unofficial flight, with Leutnant (2nd Lt.) Erwin Ziller at the controls, took place on December 18, 1944. As one of the Horten brothers later recalled, this was the first flight of one of their designs under jet power.

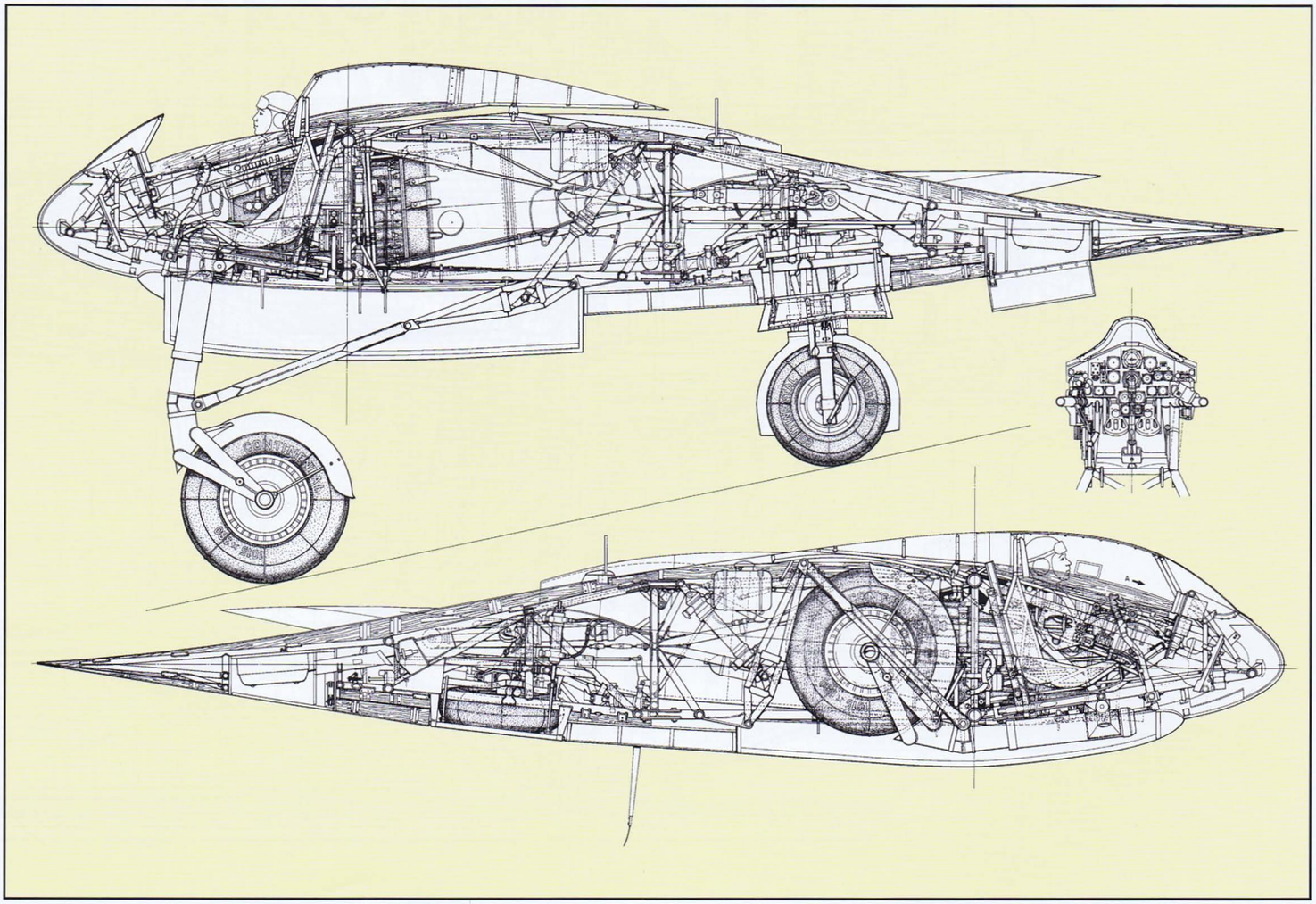
Because of Reichsmarschall Göring's influence, the Ho 229 was included in the Jäger-Notprogramm (fighter emergency program). On September 21, 1944, the first forty production Ho 229 A-1s were ordered. These were to be built by Gothaer Waggonfabrik[14]. Initially, the firm of Klemm, located at Böblingen, near Stuttgart, was supposed to build twenty Ho 229s. Gotha was to build an additional twenty aircraft. During late 1944, initial attempts to set up a small production line near Gotha failed to materialize. During this period, Möbel May, a small furniture firm near Tamm in Wurttemberg, was brought into the program to manufacture wooden wing sections.

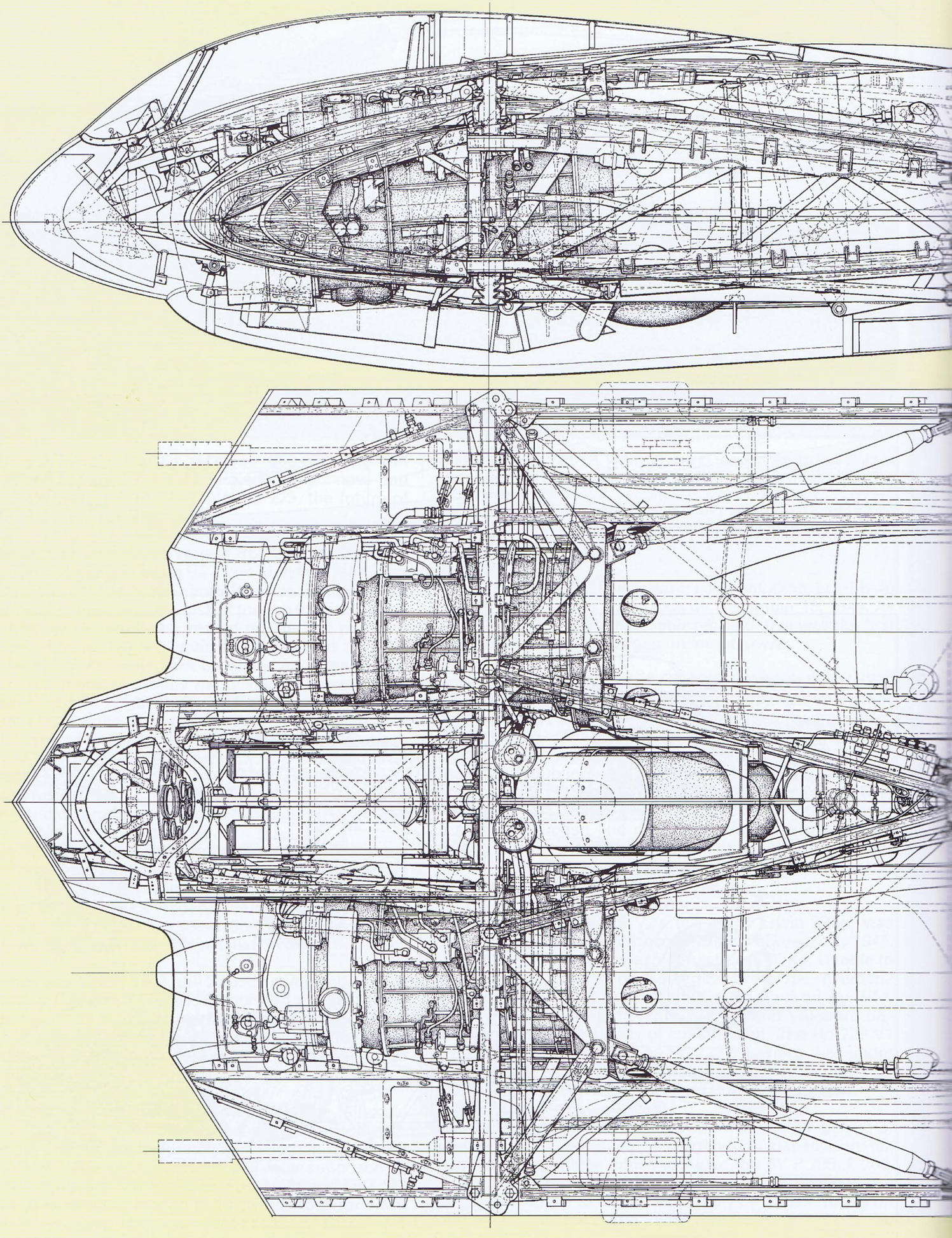
The fate of the Ho 229 V2's test pilot, Erwin Ziller, was sealed when a flame-out occurred on February 26, 1945, during the landing approach of his fourth flight. Unable to recover, Ziller crashed, destroying the prototype. When the US 3rd Army Corps reached the Gotha plant on April 14, 1945, three Ho 229 prototypes (V4, V5 and V6) were discovered in various stages of construction. The Ho 229 V1 was captured at Leipzig. The Ho 229 V3, which was under construction at the end of the war, was also seized, and was subsequently shipped to the USA for evaluation.

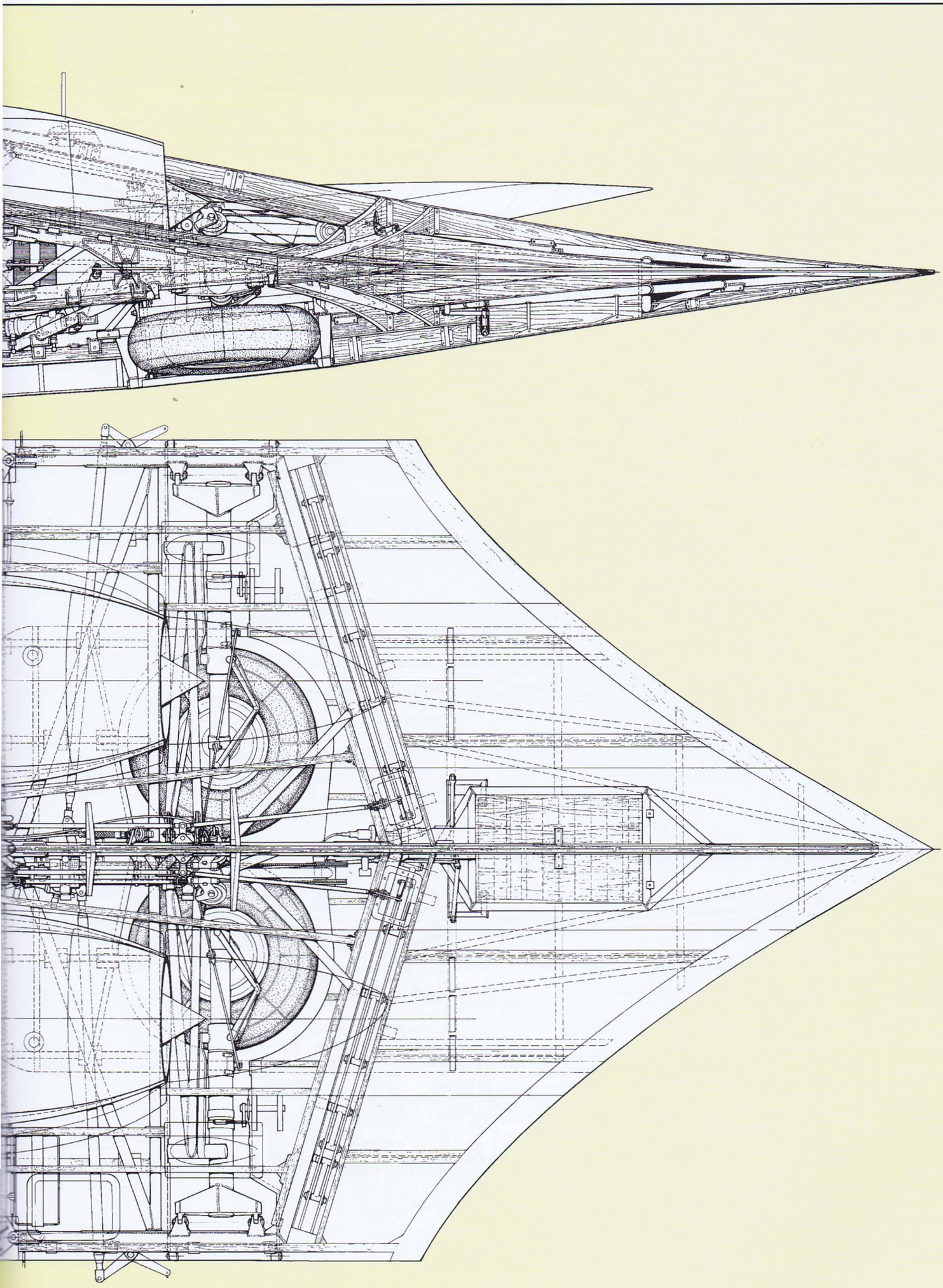
During 1943-1944, Dr. Richard Vogt, the creative genius of Blohm & Voss, designed five highly unusual scissors-tail semi-tailless fighters, which included the BV P 208, P 209, P 210, P 212 and the P 215. The first, the BV P 208, was a single-seat fighter to be powered solely by a powerful piston engine such as the Jumo 222 E (for the BV P 208.01), the

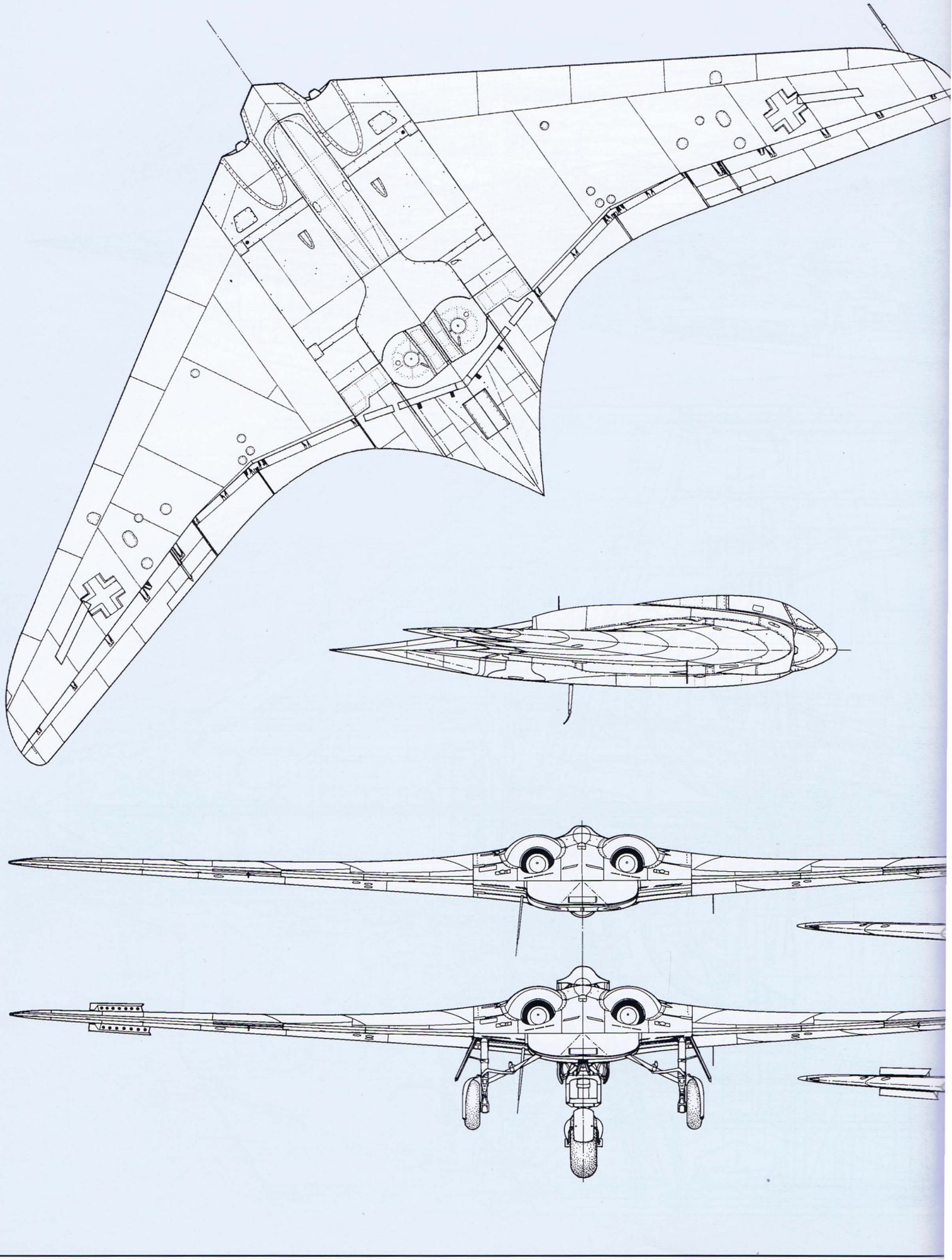
14 Code named "Ortlepp Möbel Fabrik"

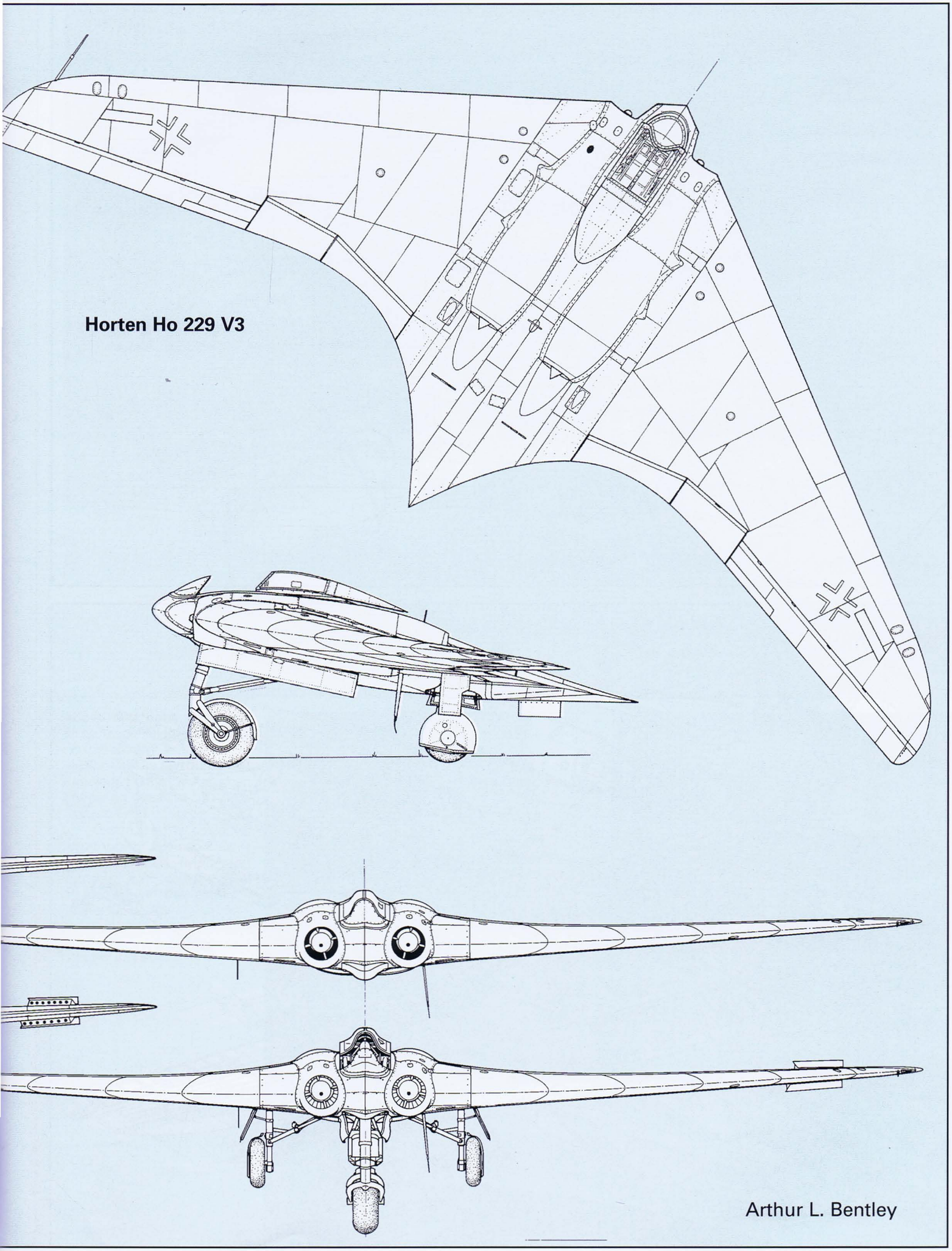

CONTINENTAL

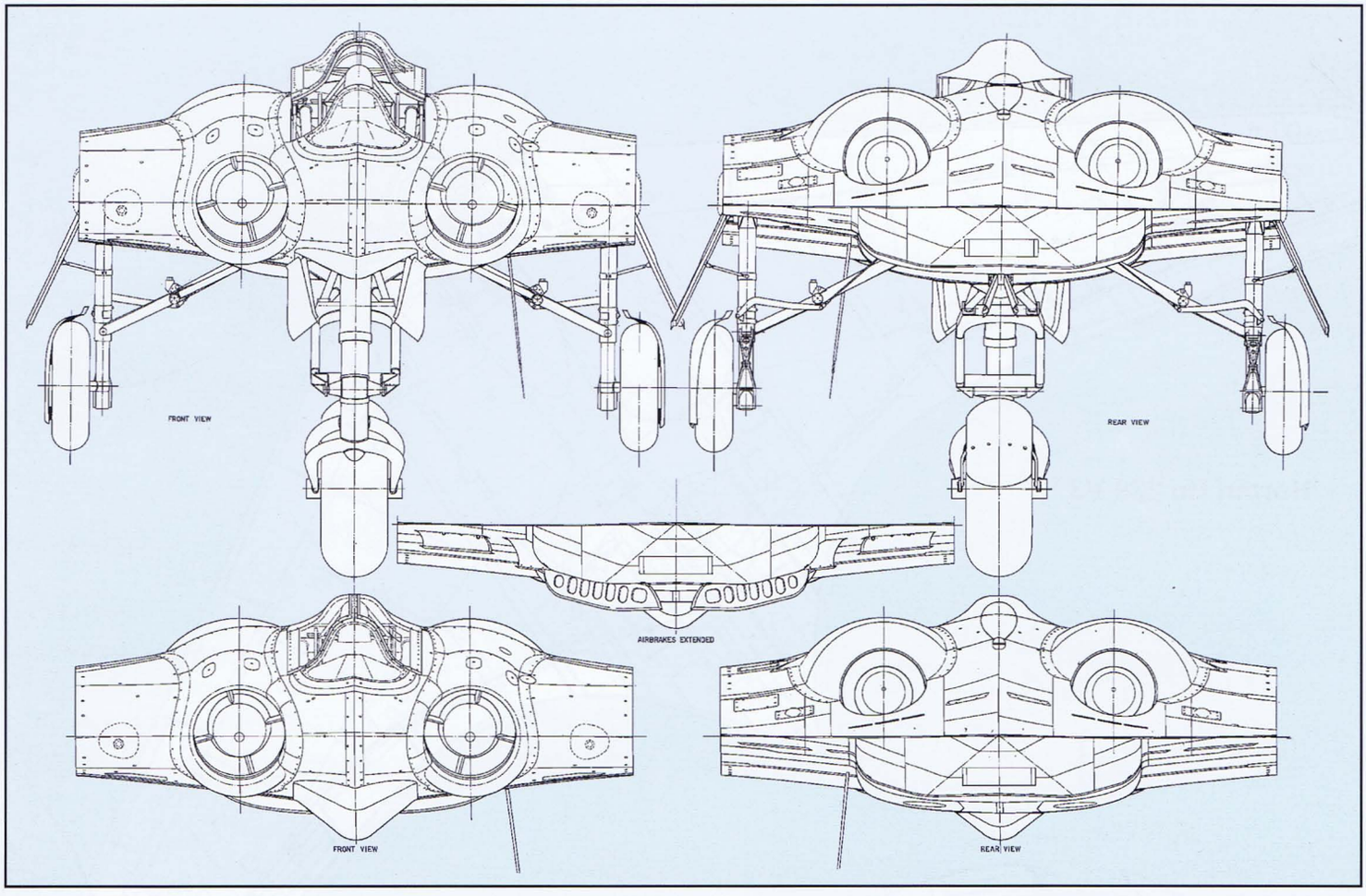

CONTINENTAL

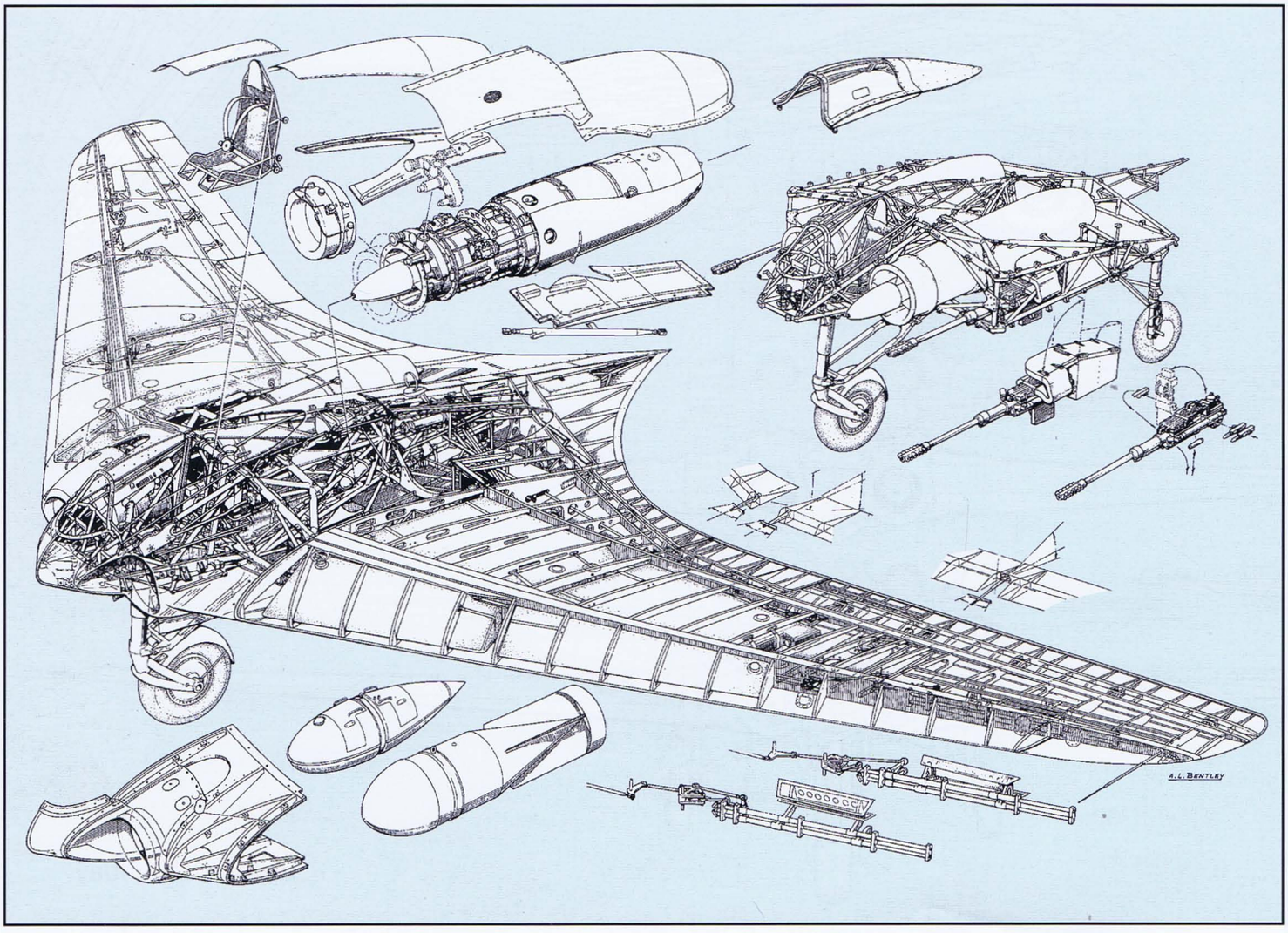




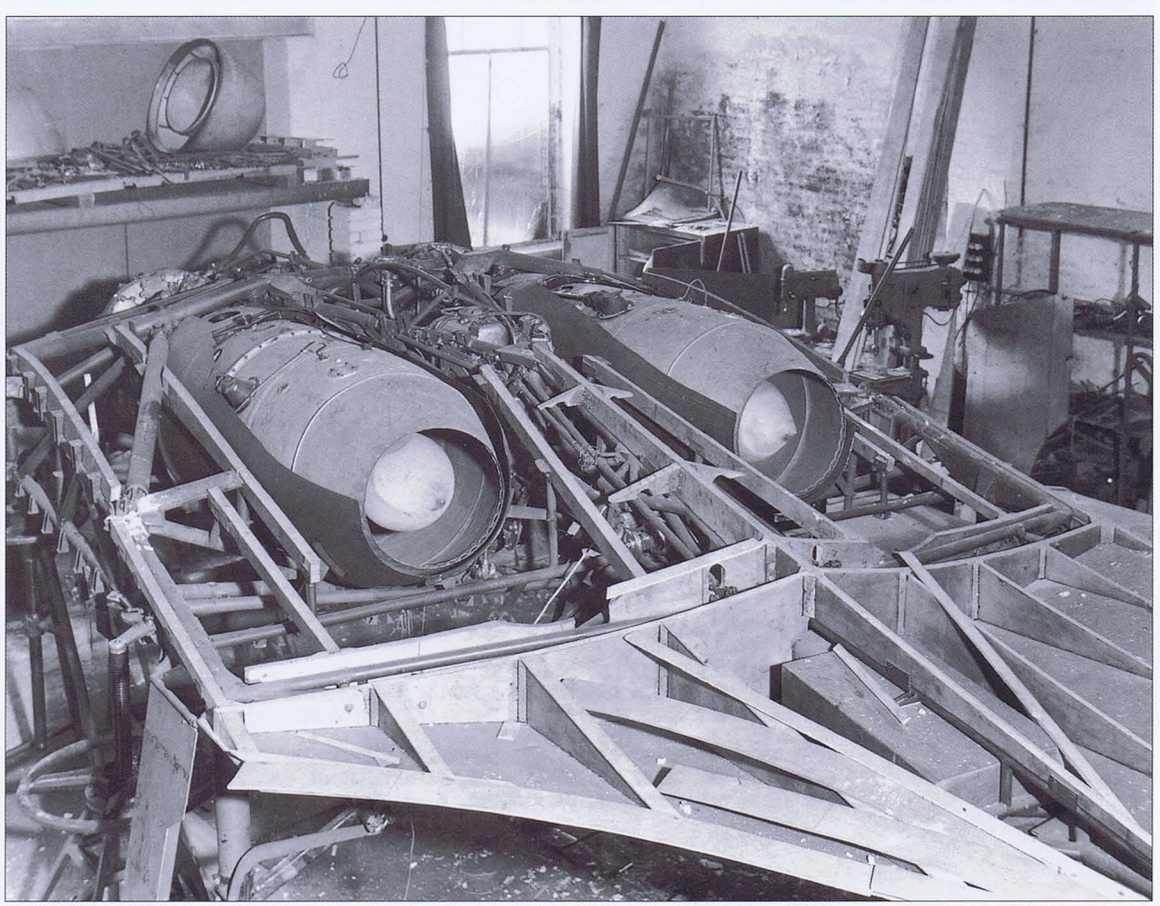



Horten Ho 229 V3
Arthur L. Bentley


FRONT VIEW
REAR VIEW
AIRBRAKES EXTENDED
FRONT VIEW
REAR VIEW

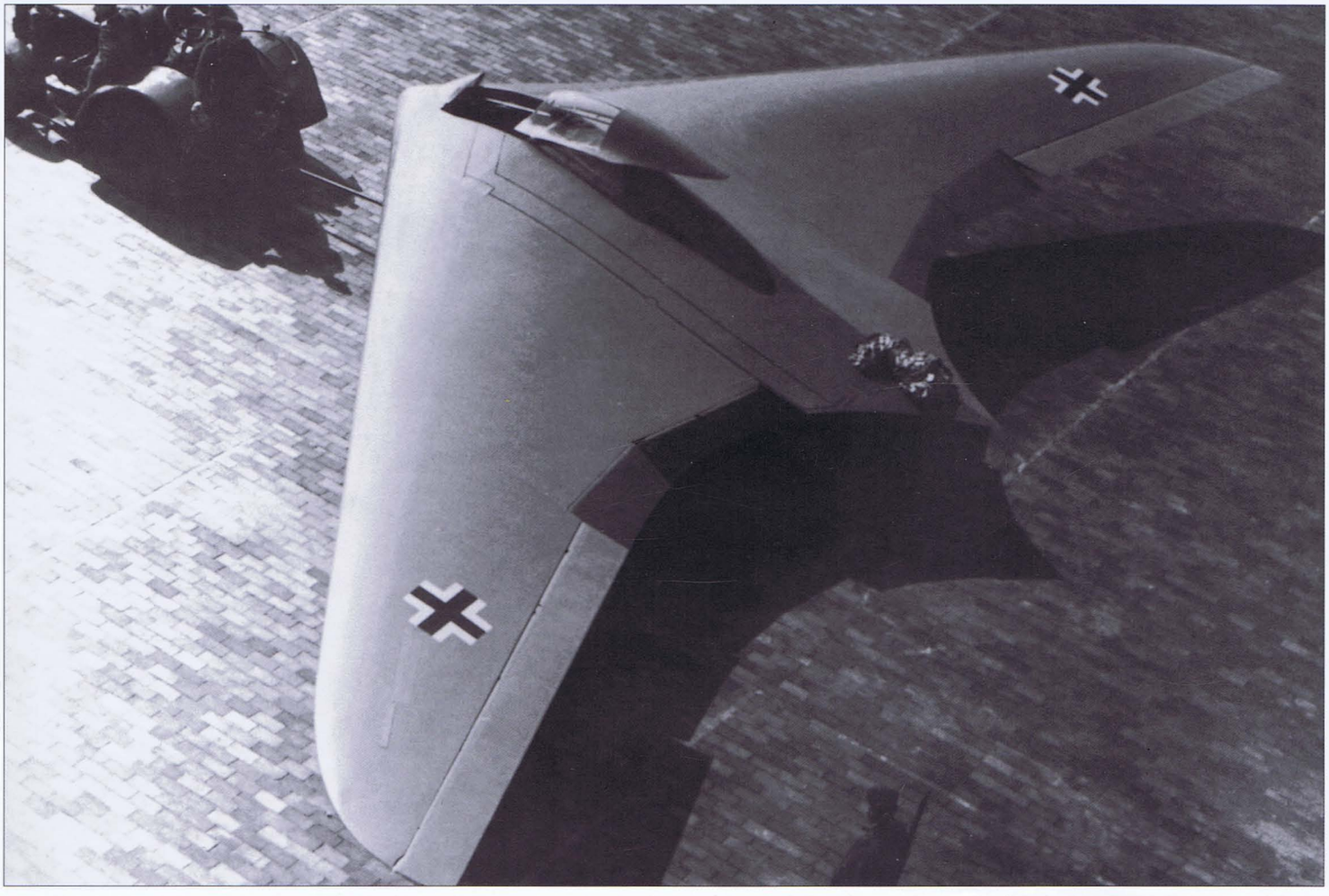

A.L. BENTLEY

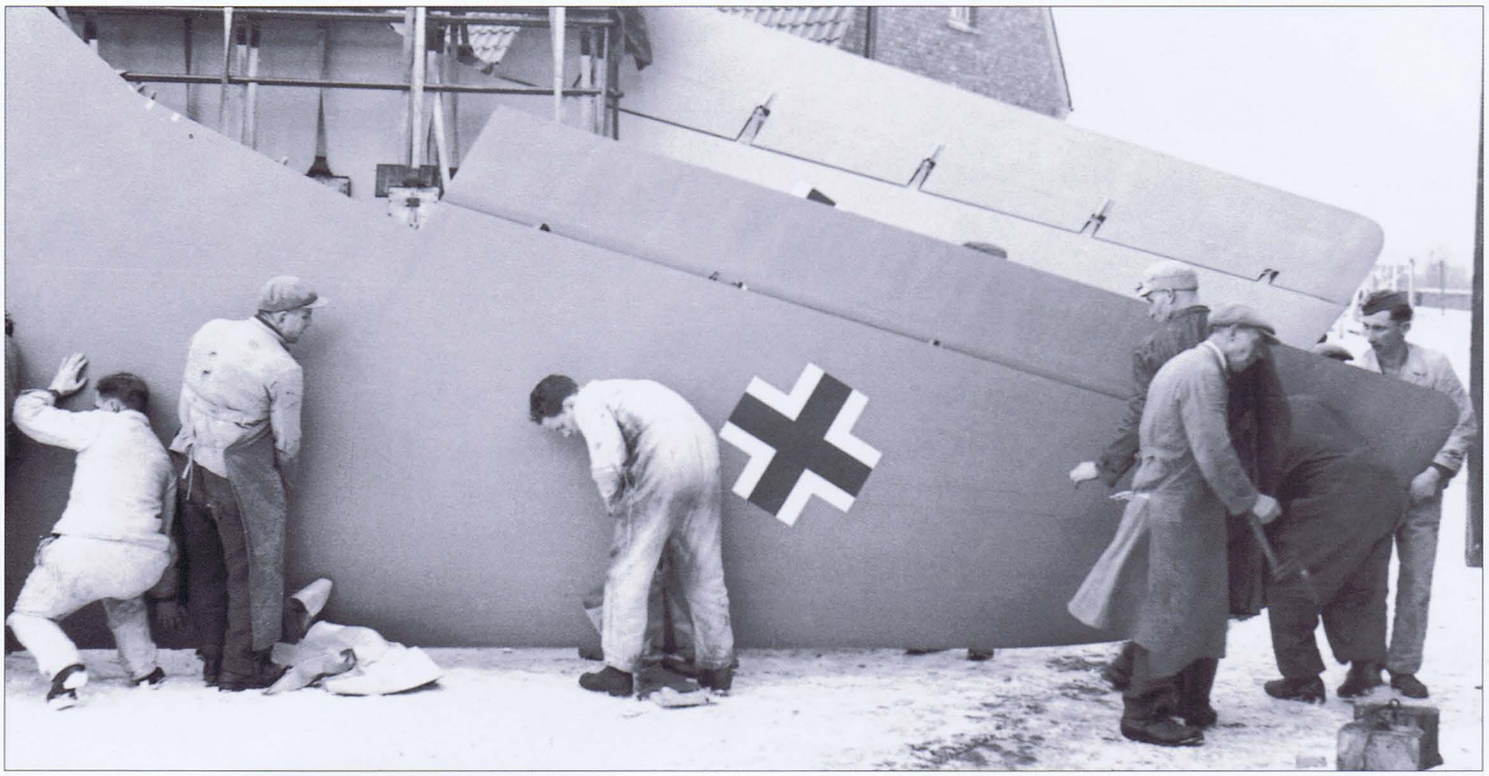
Above and right: Close-ups of an unidentified incomplete Ho 229 airframe tubular center section with its two Jumo 004 turbojets. Found by American troops on April 14, 1945 at Gotha's Friedrichshroda facility. Gotha was assigned responsibility for manufacturing the Horten flying-wing fighter in spite of their deep concern over the aircraft's inherent instability.



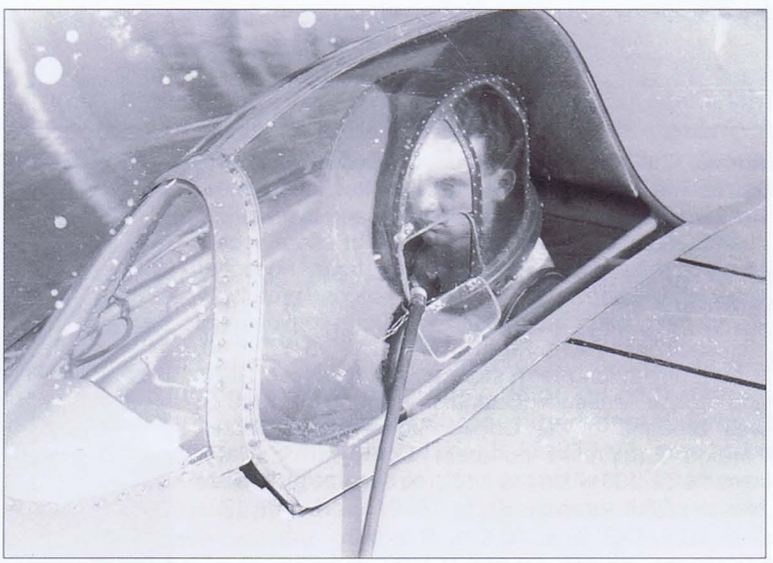
Above: An American Army Sergeant poses next to a Ho 229 center section tubular frame found at Friedrichshroda in April 1945. Friedrichshrode was one of Gotha's satellite facilities that served as a primary manufacturing center for the first examples of the Ho 229.

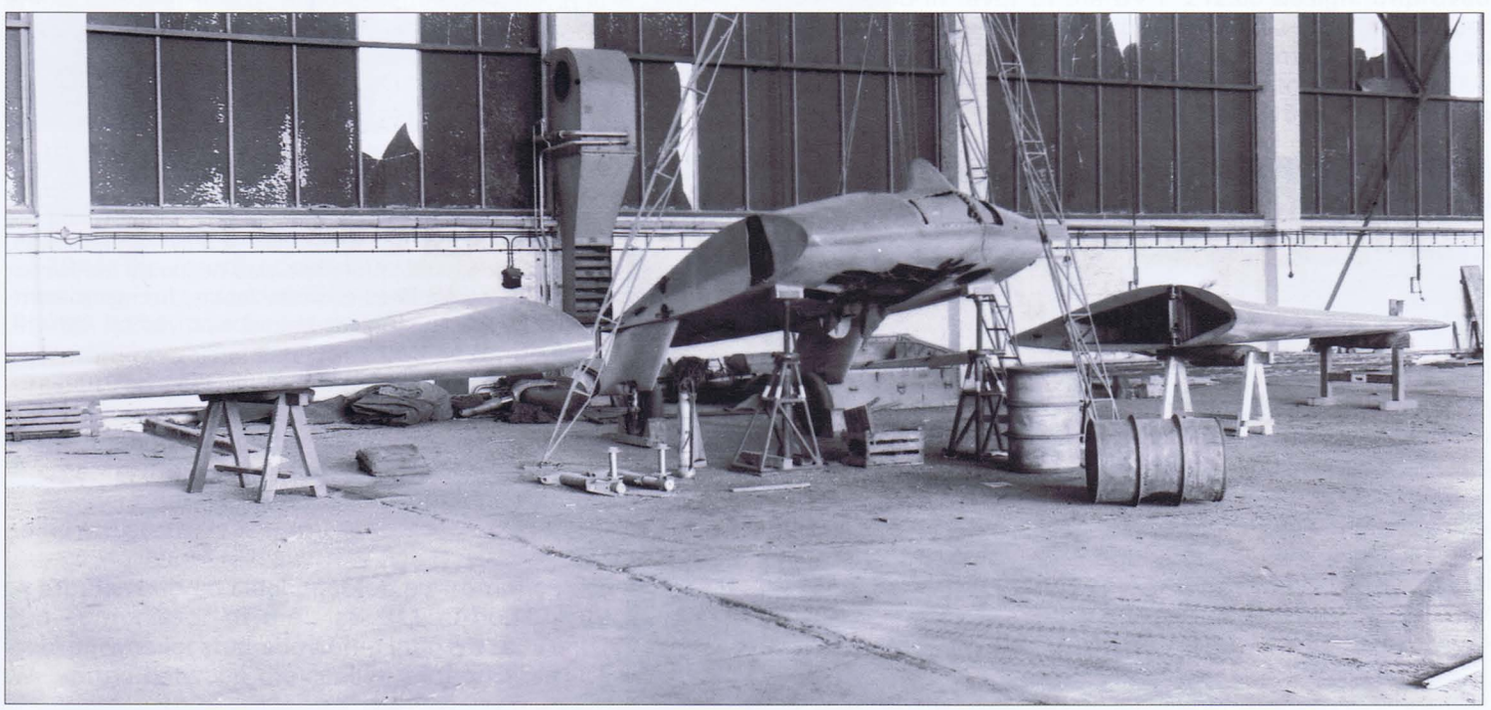
Below: This view of the Ho 229 V1 well illustrates the flying-wing's apparent simplicity. This unpowered prototype is shown being towed to the flight line for its first flight.



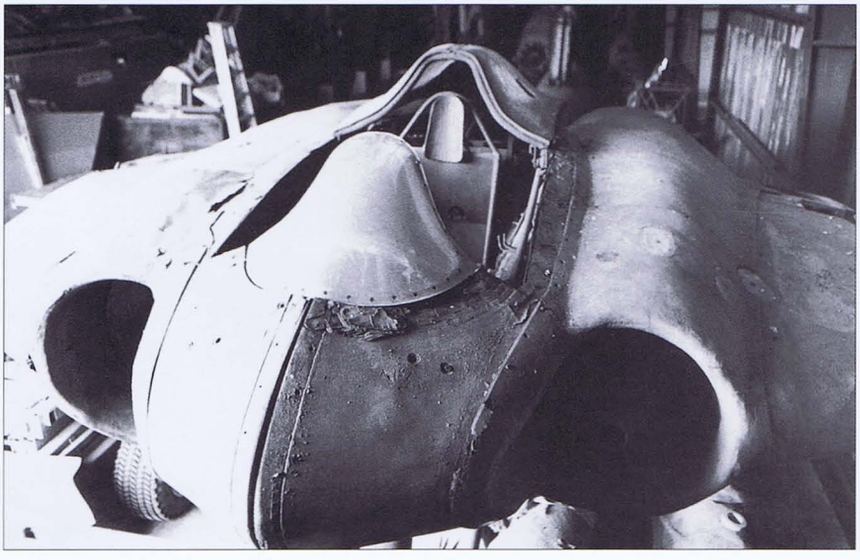


Above: Horten workmen manhandle the large plywood wings of the Ho 229 V1. Great woodworking craftsmanship went into the construction of the wings. **Right:** One of the more unusual derivatives of the Ho 229 program, was the development of a high-altitude pressurized flight suit designed by the Horten brothers. Though never flight tested, it was to be used in lieu of cabin pressurization. **Below:** When American troops arrived at Brandis airfield, near Leipzig, in April 1945, they discovered the disassembled Ho 229 V1 minus its nosegear.

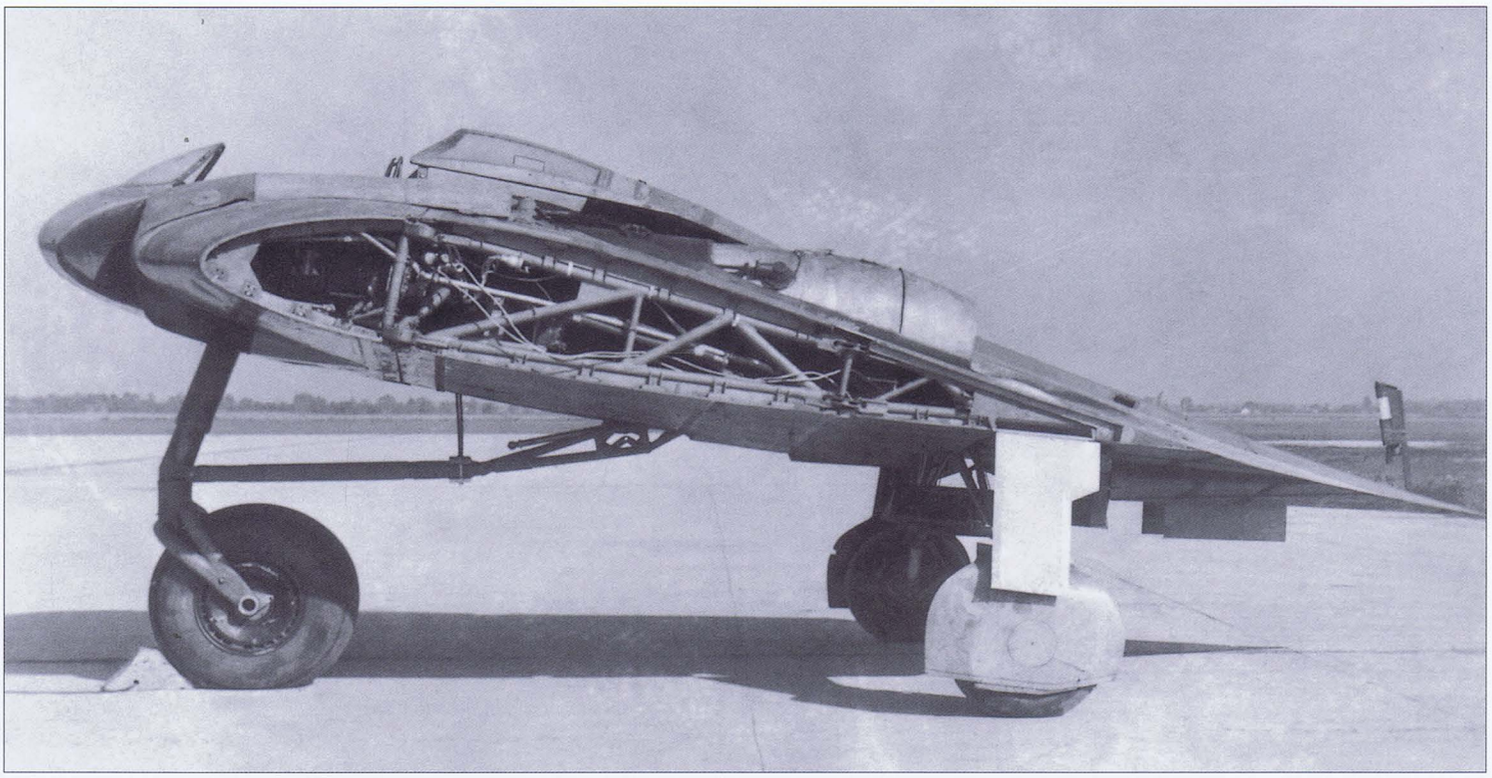




Above: Noted aviation artist, John Amendola's striking representation of the initial production version, the Ho 229 A-1, graphically depicts the aircraft's salient characteristics. It must be noted that more recent research has determined that the large nosegear cover (shown above) first used on the second prototype, would have been abandoned for more conventional clamshell gear doors. **Right:** The Ho 229 V3, W.Nr. 40, is currently in long term storage with the National Air and Space Museum. During the spring of 1945, it was brought to the United States and allocated Foreign Equipment number FE-490, which later became T2-490 when the Air Force became a separate branch of the services.



Left: Today, the Ho 229 V3 quietly rests with other aircraft awaiting restoration by the National Air and Space Museum. Over the years, the thin plywood covering the aircraft's center section has badly deteriorated. Construction of this prototype was begun by the Horten team at Gotha's Friedrichsroda facility, but never completed by the time American troops arrived on April 14, 1945. It was to serve as a flying prototype for the initial production series, but without armament.



Above: This well-known view of the Ho 229 V3's center section, taken at Wright Field in 1945, clearly shows the aircraft's extremely shallow profile to advantage. Although the prototype's wings have survived, they have never been mated to the center section.

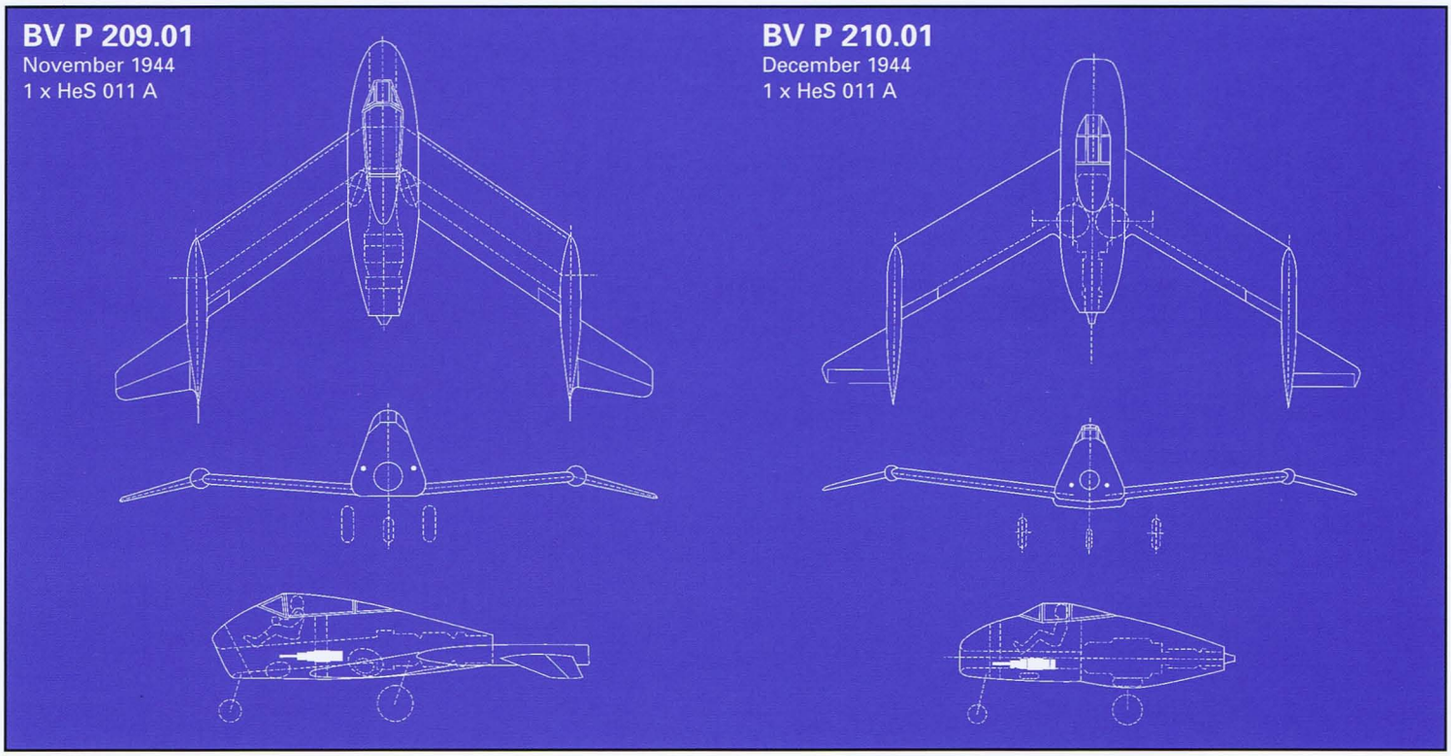
As 413 (for the BV P 208.02), or the DB 603L (for the BV P 208.03). These propeller-driven designs lead directly to the jet-powered BV P 209 which was to use a single HeS 011 mounted in the rear of a short fuselage. Dr. Vogt brilliantly recognized four major advantages inherent in the unorthodox scissors-tail: (1) The number and junctions of aerodynamic surfaces can be kept to a minimum, (2) Thanks to the upwash of the wing tip vortex, the empennage surface can be reduced without loss of effectiveness, (3) Boom mounted empennages provide significant advantages to control moment arms, thereby minimizing the sweep required for trim, and (4) owing to the concentration of the wingspan loading toward the tip combined with the endplating effect of the boom, aileron effectiveness is increased which facilitates a reduction aileron size...which also allows the majority of the wing trailing edge to be used for high lift devices. The BV P 209 would have been armed with two MK 108s with an estimated maximum speed of 615 mph (990 km/h) at 29,000 ft (8,839 m). The third scissors-tail fighter, the BV P 210, was essentially similar in layout to the P 209 but with a slightly larger wing (area increased from 140 ft^2 to 161 ft^2 [13,0 m^2 – 14,9 m^2]) and powered by a BMW 003 turbojet. During the autumn of 1944, the fourth scissors-tail design was developed at Hamburg-Finkenwerder. This semi-tailless single-seat fighter, the BV P 212, was based on the BV P 210 but powered by the more powerful HeS 011 turbojet, and equipped with a pressurized cockpit, It would have been armed with two MK 108s (with 100 rpg) positioned on either side of the cabin, with provision for a third MK 108 (with 60 rounds) in the center immediately in front of the cockpit. The wing was steel-skinned, with the fuel tanks incorporated into the wing structure.

A tubular, curved steel duct fed air from the nose intake to the compressor of the HeS 011 turbojet. A pressurized cockpit was located above the intake duct. A fuselage tank was fitted between the cabin and the HeS 011 jet engine, which — together with the wing tanks — gave a total capacity of 346 US gallons (1,310 liters).

Instead of the three forward-firing MK 108s, twenty-two R4M air-to-air missiles could be carried. Ten different armament proposals were considered. The best weapon arrangements proved to be either up to seven MK 108s, or one MK 112 and two MK 108s, or twenty-two R4Ms and two MK 108s.

On February 15, 1945, Chef Technische Luftrüstung instructed Blohm & Voss to evaluate the wing and outer fin- section designs. Also, tests were to be made to verify the strength of the material selected for the design, as well as the structural layout. A few days later, on February 23, 1945, a production plan for three experimental aircraft was drawn up. The first prototype, BV P 212 V1, was to be finished by mid-August, while the second test aircraft was planned for September, 1945, at the latest. Meanwhile, further development of the P 212.01 and P 212.02 was abandoned in favor of the BV P 212.03 design. Improved flight characteristics were expected from a modified rudder design. By mid-April, 1945, the development came to an end without the award of an official contract by the RLM. The fifth scissors-tail project, the BV P 215 night fighter, is discussed in volume 2.

In contrast to the He P 1078A (see p. 45), the He P 1078B Jäger, schwanzlos, Entwurf I (fighter, tailless, design I) was an unusual flying-wing fighter. Much less conventional than the version A, the P 1078B was a tailless design with a wing sweepback of forty degrees. There were no vertical control surfaces in the usual sense, but the wing tips had a pronounced anhedral, and control surfaces were provided both on the main wing and on the drooping tips. The fuselage was short and wide, with twin protruding nose-tips. The pilot's cockpit was in the port nose section, while the weapons bay was fitted to the starboard nose cone. Armament was to consist of two or more MK 108s (75 rpg), firing forward. Advanced automatic triggering of the weapons was designed by Heinkel engineers early in 1945. The offset nosewheel retracted into the starboard nose section. The mainwheels retracted forwards and upwards into the wings.



Above: The BV P 209 and BV P 210 semi-tailless projects were complimentary but distinct designs with scissor-tail control surfaces previously planned for the BV P 208, a similar propeller driven fighter project.

The intake for the single HeS 011 A-1 turbojet engine was located centrally between the nose cones, the turbojet itself being mounted in the rear of the fuselage. A single large fuel tank compartment took up the upper fuselage, extending into the wing roots.

The military load was calculated at 3,395 lb. (1,540 kg). The aircraft's all-up weight, including powerplant, tanks, fuel, and pilot would have been 18,825 lb. (8,540 kg). The top speed of 637 mph (1,025 km/h) was about 31 mph (50 km/h) higher than that of the P 1068A project. At 39,400 ft (12,200 m) altitude, a top speed of 565 mph (910 km/h) was anticipated. At full throttle, a maximum range of 963 miles (1,550 km) for the single-seat day fighter version was expected. A ceiling of over 45,100 ft (13,750 m) would have been theoretically obtainable. The small aircraft had a span of 29.5 ft (9,00 m), and a fuselage length of about 16.4 ft (5,00 m). Interestingly, this design was finished between May and July 1945, under Allied supervision at Penzing near Landsberg in Bavaria.

Another Heinkel design submitted for the single-seat fighter competition in early January, 1945, was a modified He 1078B. This second variant of the P 1078 had its air-intake in the nose of the central fuselage, which was flattened to provide space for the pilot's cockpit located above the nosewheel well, the two nose tips of the earlier design having been rejected by the Chef TLR and the OKL.

One MK 108 each (100 rpg) was mounted to the left and to the right of the pilot's cockpit. The HeS 011 turbojet occupied the whole of the fuselage.

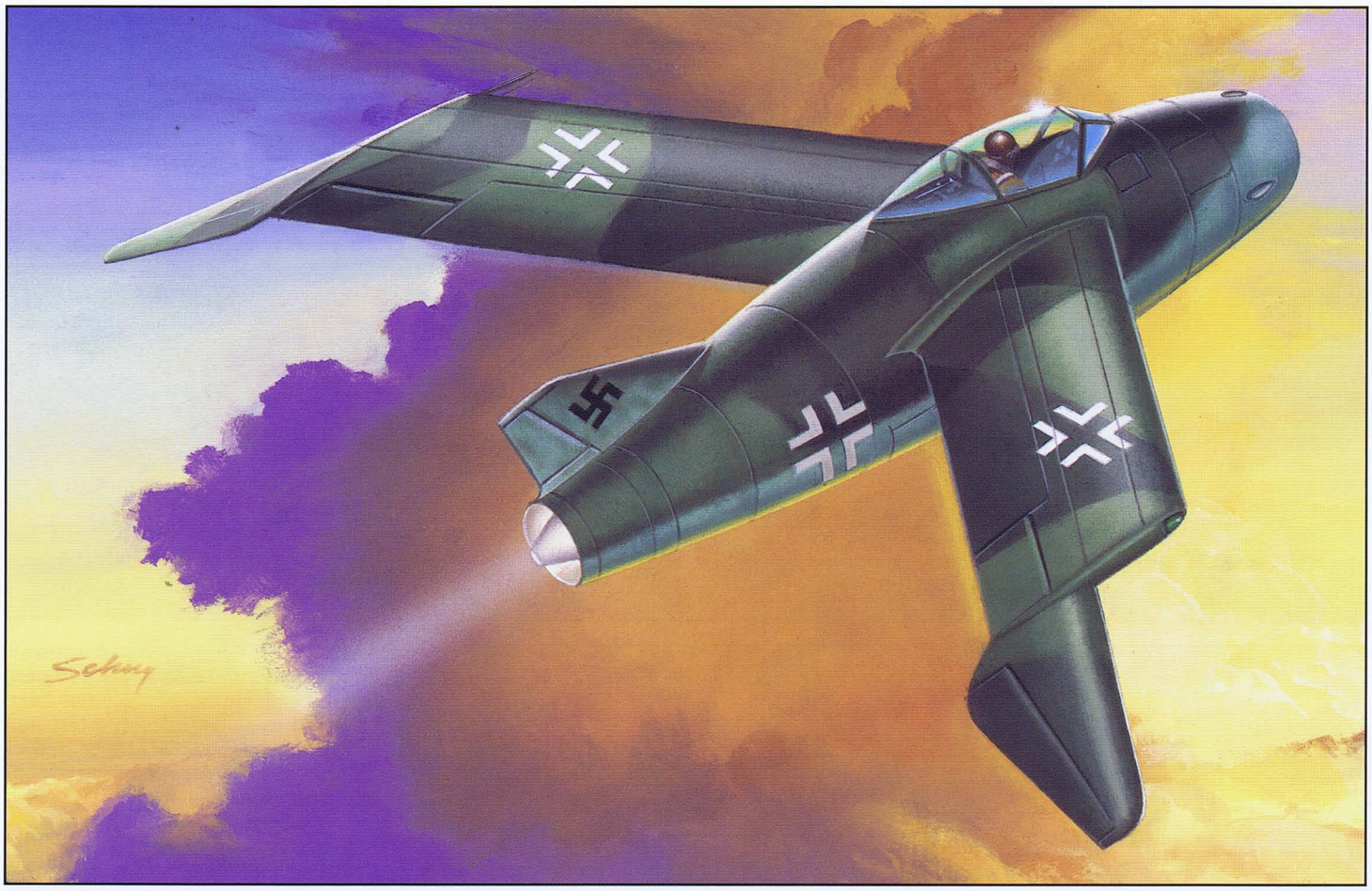
Together with the He P 1078B, the BV P 212.02, Ta 183 Ra-3, Me P 1101, and the Ju EF 128 were each evaluated by the Deutsche Versuchsanstalt für Luftfahrt (DVL), in Berlin-Adlershof early in 1945. Surprisingly, no clear-cut winner was declared despite of the urgency attached to the whole program. Instead, since more design proposals were expected in April, 1945, a final decision was not made at this time.

The Junkers EF 128[15], mentioned above, was one of the most advanced projects to originate from this period. The aircraft, of which a two-seat night-fighter version (see Vol. 2) with a lengthened fuselage was also planned in 1945, was a single-seat tailless fighter with an all-wood shoulder wing. Vertical control surfaces were mounted at the trailing edge of the wings, just inboard of the ailerons, which also served as elevators. A pressure cabin with ejection seat was to be standard equipment. The fuel was carried in tanks behind the cockpit, while the HeS 011 turbojet was mounted at the rear. The proposed armament was comprised of four MK 108s (100 rpg), or four MG 151/20s. In addition to the fuselage tanks, wing tanks containing 143 US gallons (540 liters) were also planned, bringing the total fuel load to 420 US gallons (1,590 liters). The intakes for the jet engine were semi-recessed scoops located under the wing on the fuselage sides.

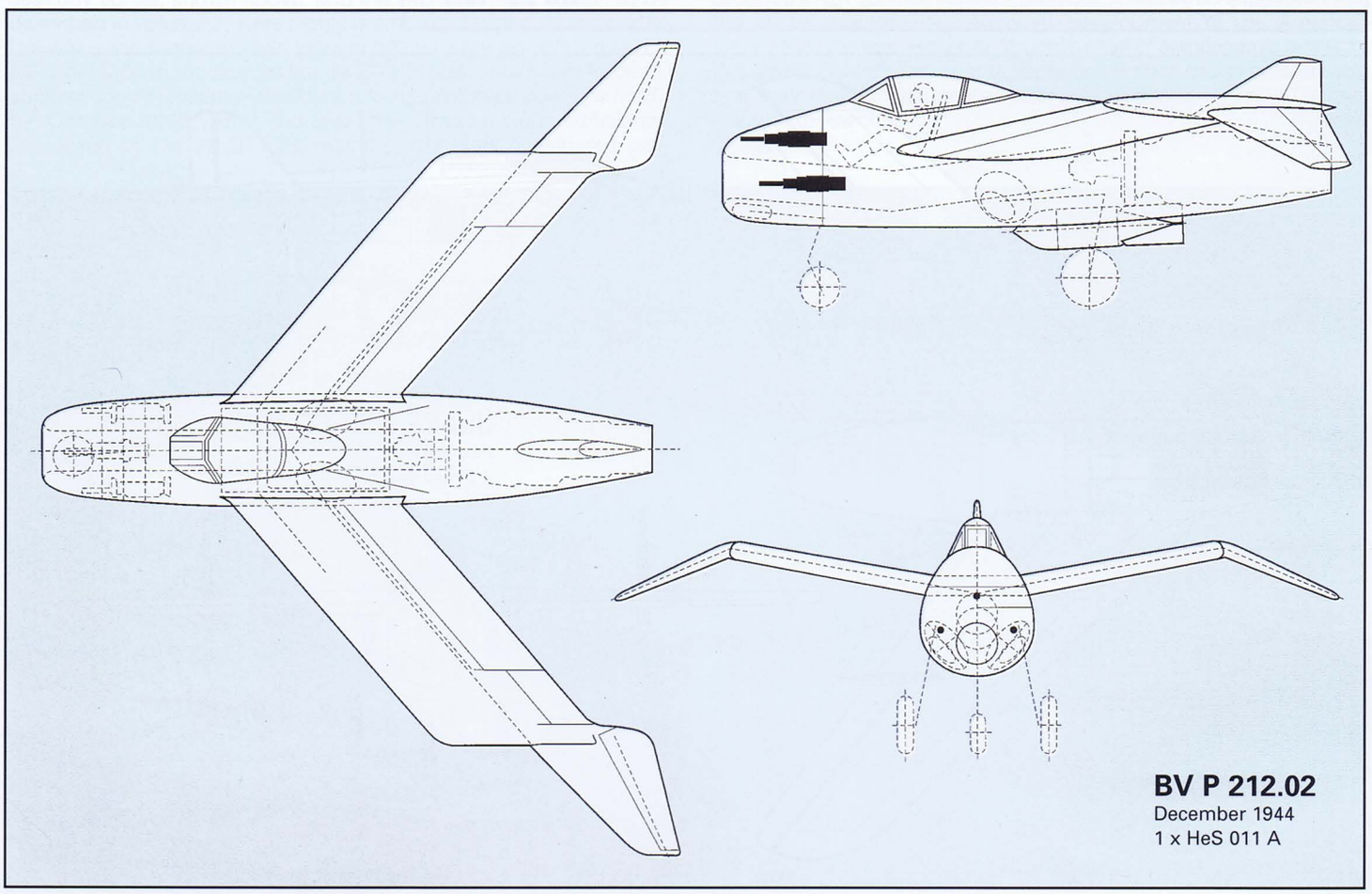
When the first reliable results of wind-tunnel tests with scale models had been obtained, calculations for the first design study were completed in December, 1944. In 1945, a full- size wooden mockup with a simulated HeS 011 turbojet was under construction. A flying, non-powered model of the Ju EF 128 was supposed to be built, and it was intended to mount this on the back of a twin-engined Ju 88 A-4 for actual flight testing.

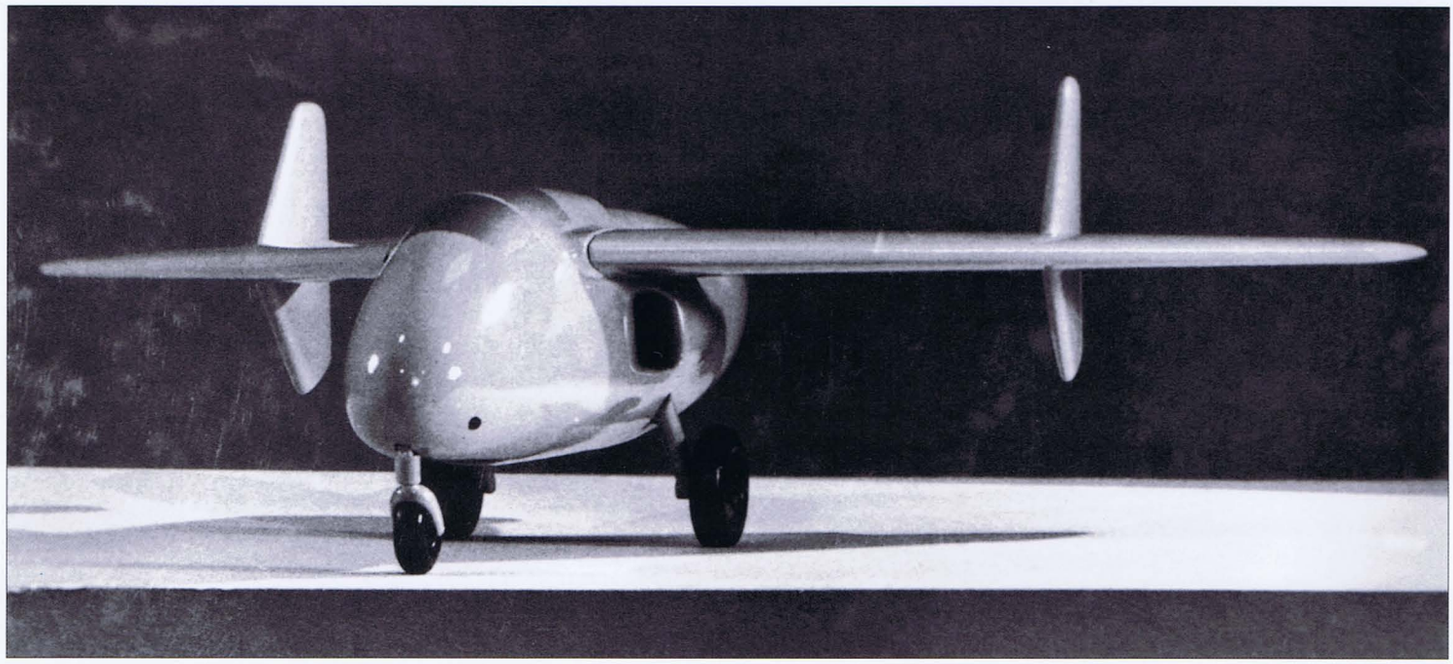
The first design studies for the Ju EF 128 had been made in October 1944, and development continued unabated until March, 1945. At Junkers' Dessau facility, modified wind-tunnel models were made and evaluated. The Junkers engineers were fearful the aircraft would lack sufficient stability, and consequently further modifications to wings and fuselage became desirable. Yet, by April 23, 1945, no satisfactory definitive results had been obtained. The staff of the Junkers Strömungstechnik (wind tunnel

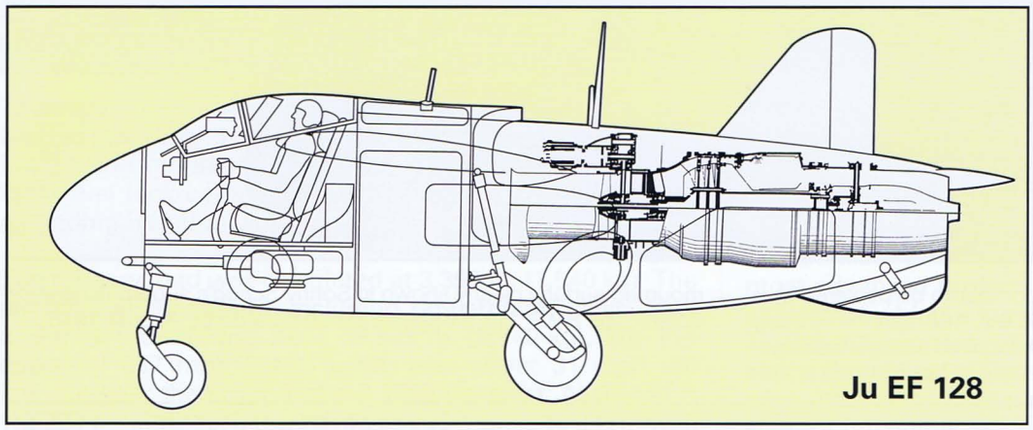
15 EF – Entwicklungs Flugzeug / Development Aircraft



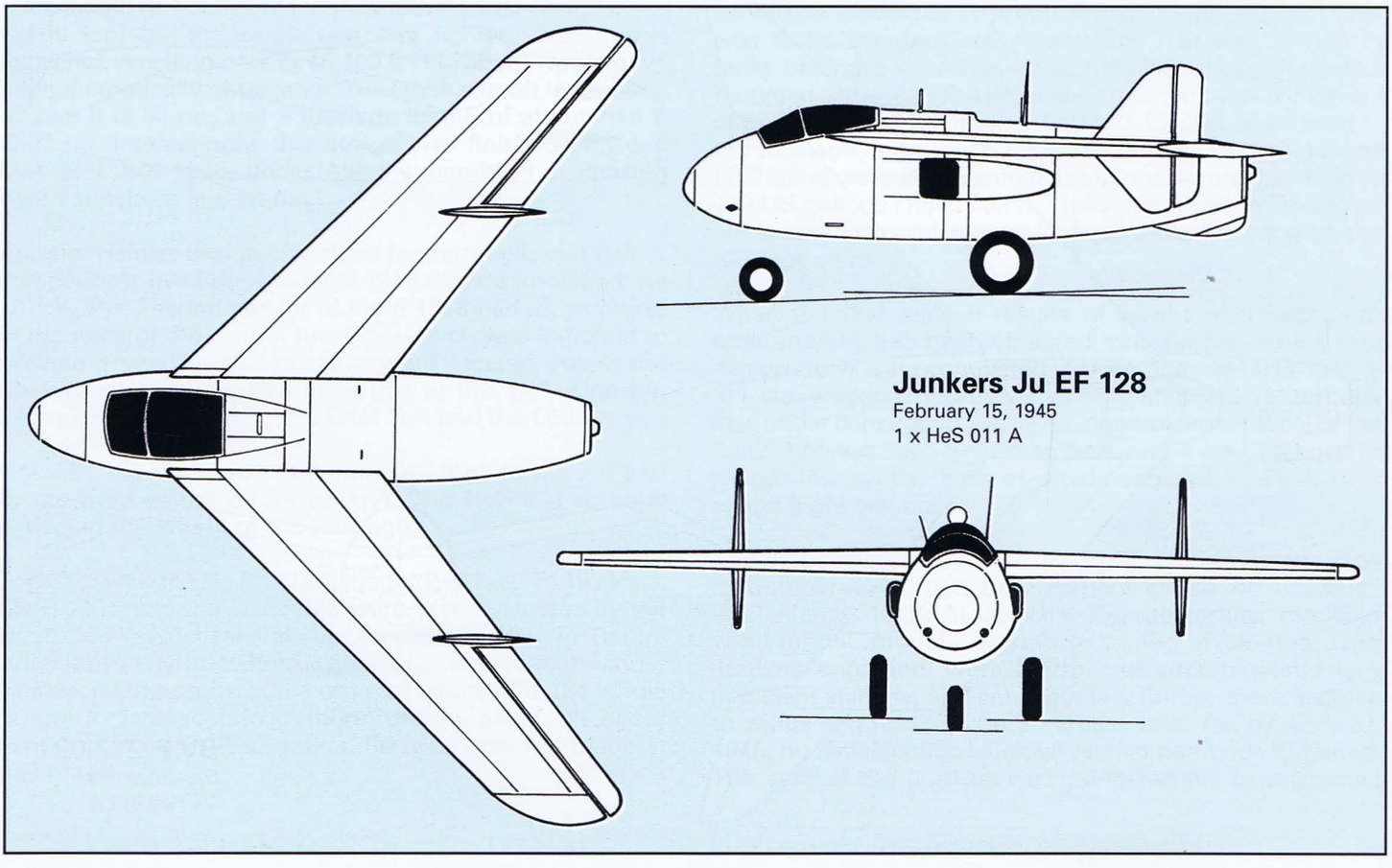
This page: The BV P 212 was a fighter-bomber to be powered by a HeS 011 turbojet and armed with three MK 108 cannon. Initially conceived without a vertical tail, it quickly acquired a single fuselage-mounted surface clearly shown in Sonny Schug's superb illustration above. The BV P 212 V1 was to be completed by August 1945.

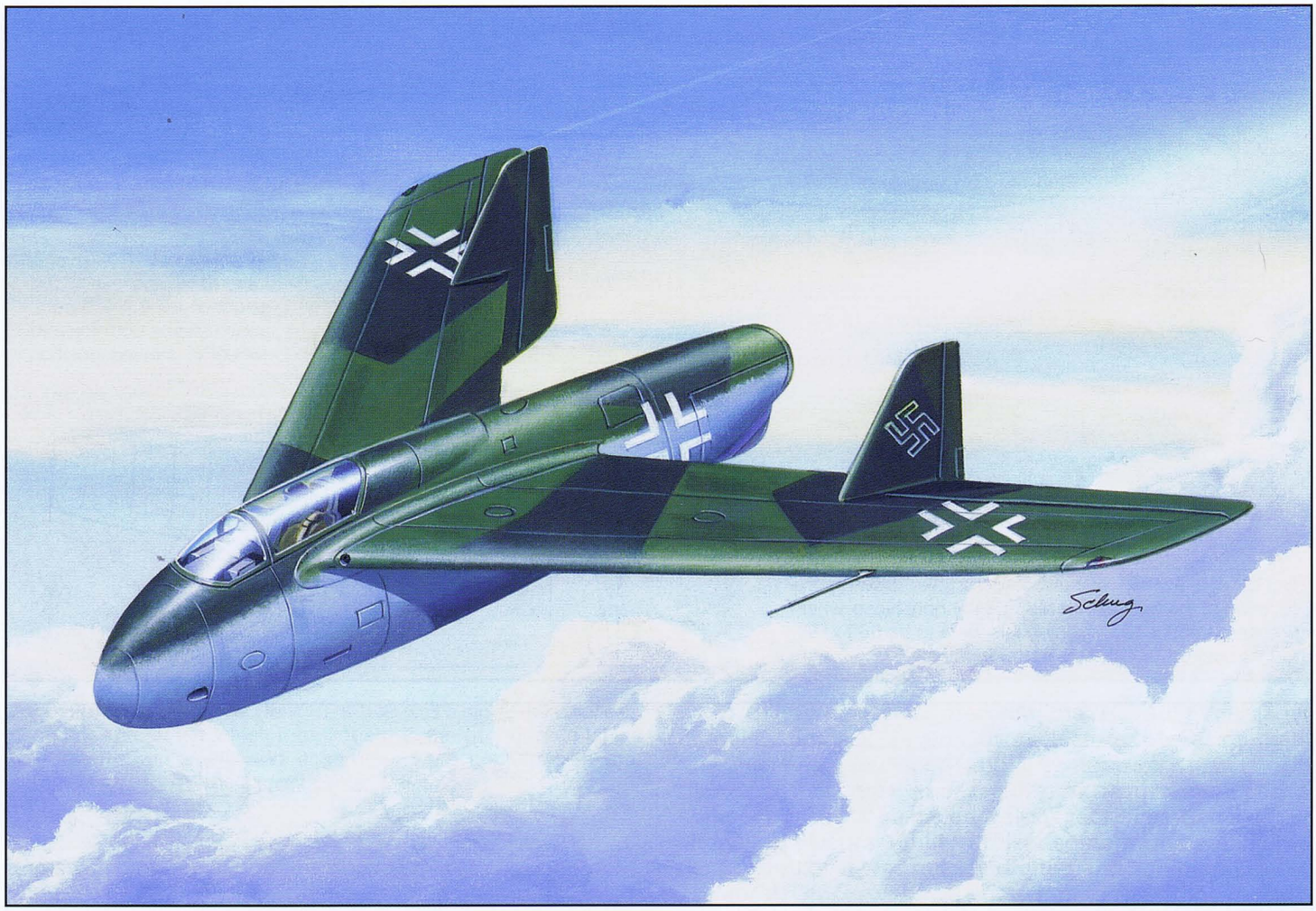




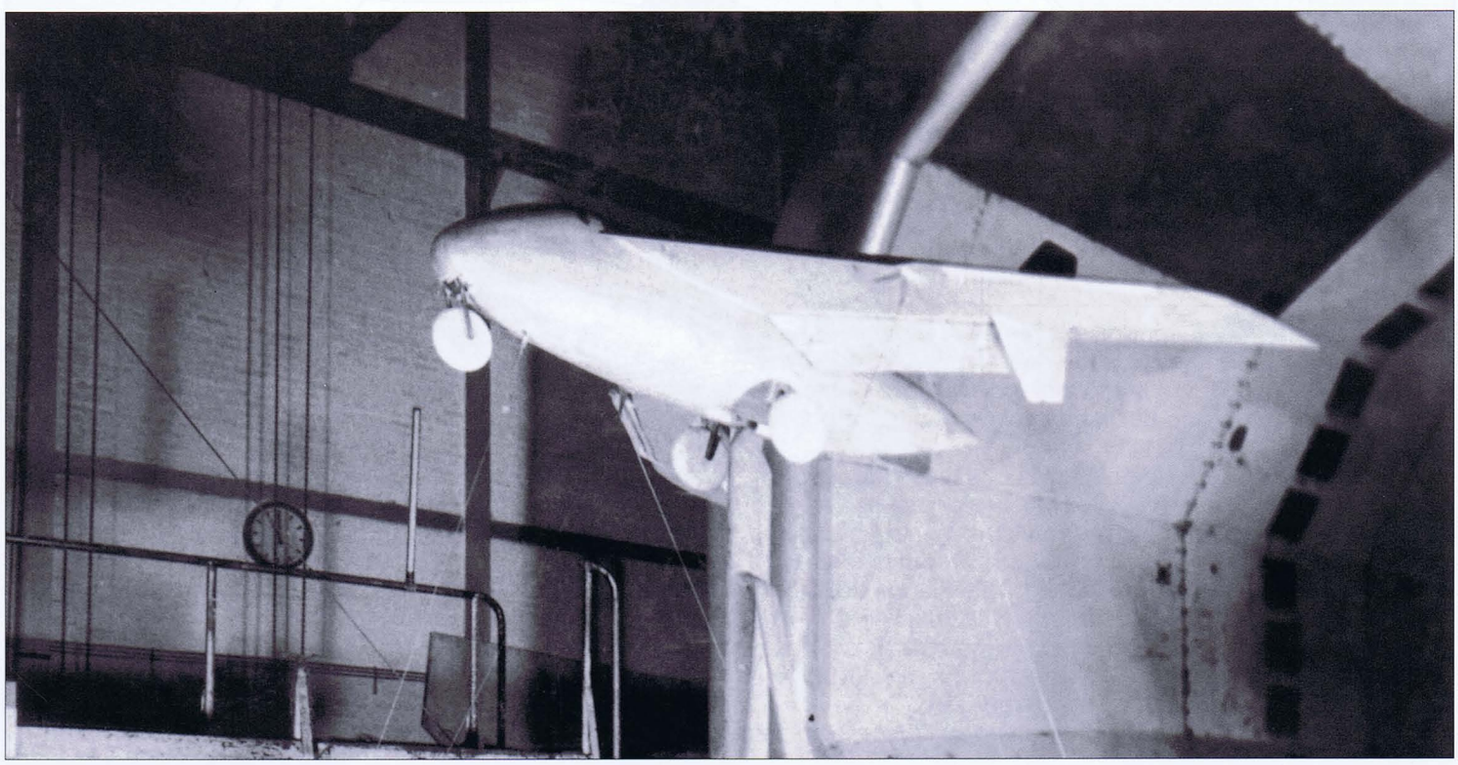


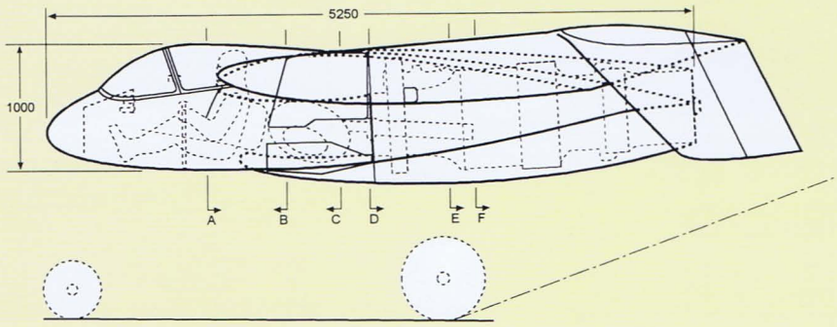
This page: The Ju EF 128 was a serious contender for the last fighter competition of the war. It would have been powered by a HeS 011 turbojet and armed with up to four MG 151/20 or MK 108 cannon. An interesting feature of the design was the auxiliary rear facing dorsal air intake. Presumably this would have drawn air from the rear fuselage decking to compensate for any blanketing that may have been created by the wing in relation to main air intakes during certain flight regimes.

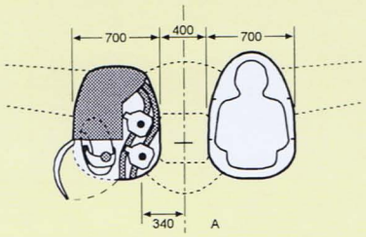




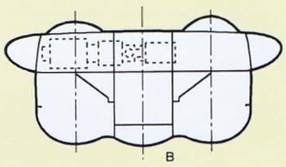
This page: Two versions of the Ju EF 128 were developed. The single-seat day fighter, shown above, and the two-seat night fighter, to be described in volume 2, were highly promising designs. At the end of the war, wind tunnel models (shown below) were completed and a full-size wooden mockup of the Ju EF 128 was under construction. Junkers engineers anticipated that a flying prototype could be ready by October 1945. After the war, the Soviets were sufficiently impressed by the Ju EF 128, that they seriously considered proceeding with prototype construction. This plan was eventually dropped in favor other Junkers projects. It has been suggested that the Ju EF 128 greatly influenced development of the American Vought F7U Cutlass. However, Vought's chief of aerodynamic research, William C. Schoolfield, adamantly rejected such arguments, stating that their design was created entirely independently from German wartime research.



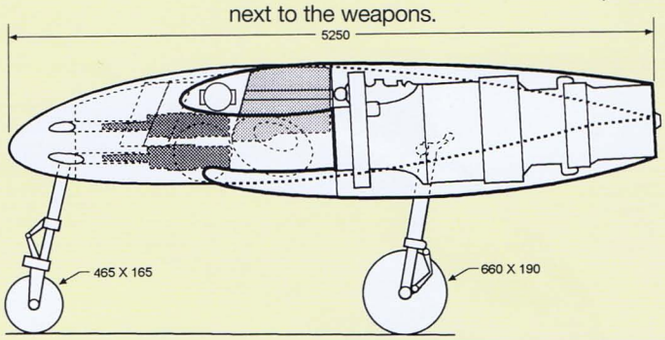


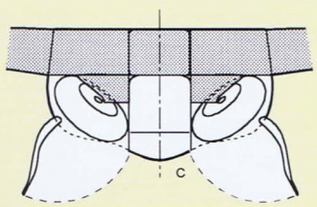


Sectional elevation of port nacelle. The overall length from nose to end of tailpipe was 17.2 ft (5250 mm) with a height of 4.7 ft (1400 mm). Cross-section "A" above shows both forward nacelles with nosewheel in stowed position next to the weapons.

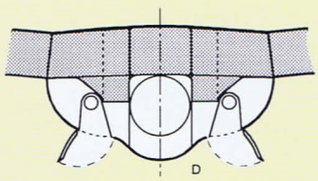


Sectional elevation of starboard nacelle showing the location of the two 30 mm MK 108 cannon. Nose-wheel was to be 465 x 165, mainwheels were to be 660 x190. Cross-section "B" shows starter location.

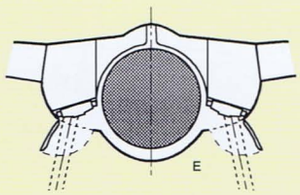




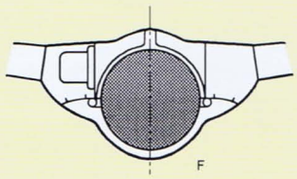
Cross-section "C" - Mainwheels



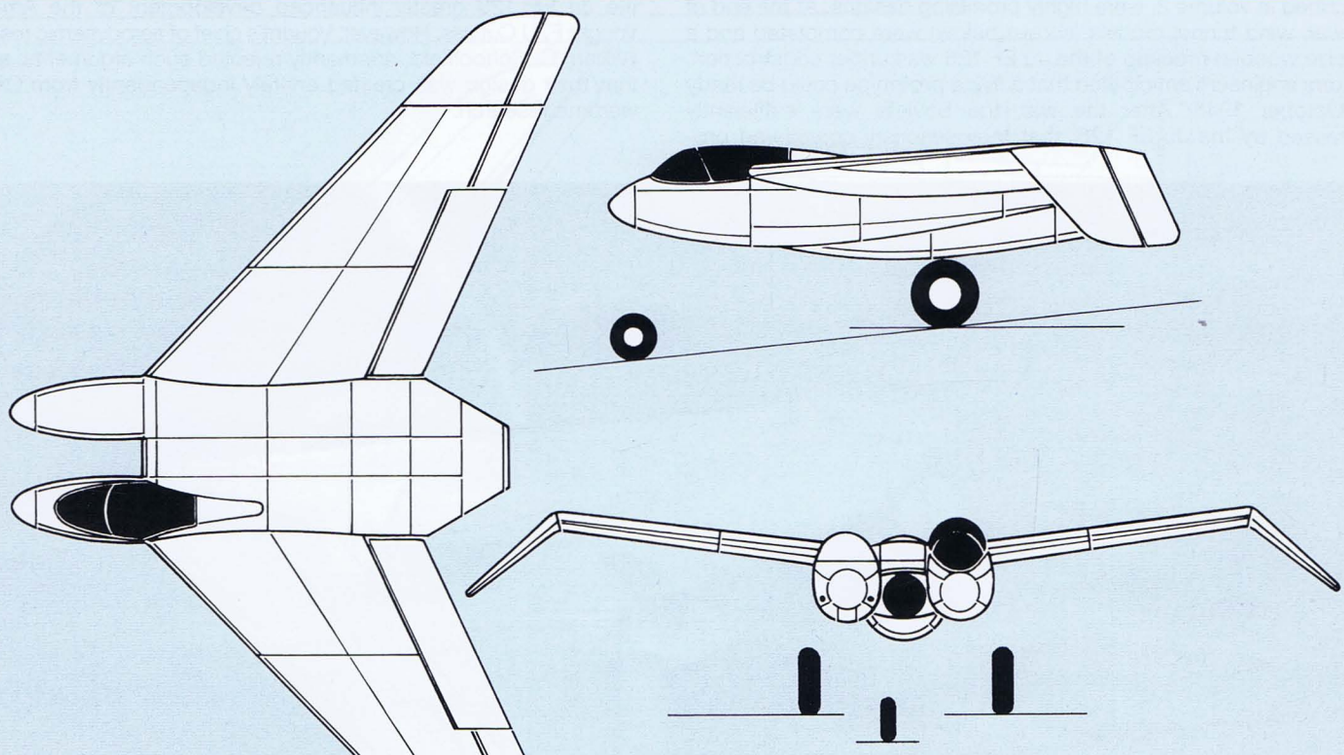
Cross-section "D" - Fuel tanks



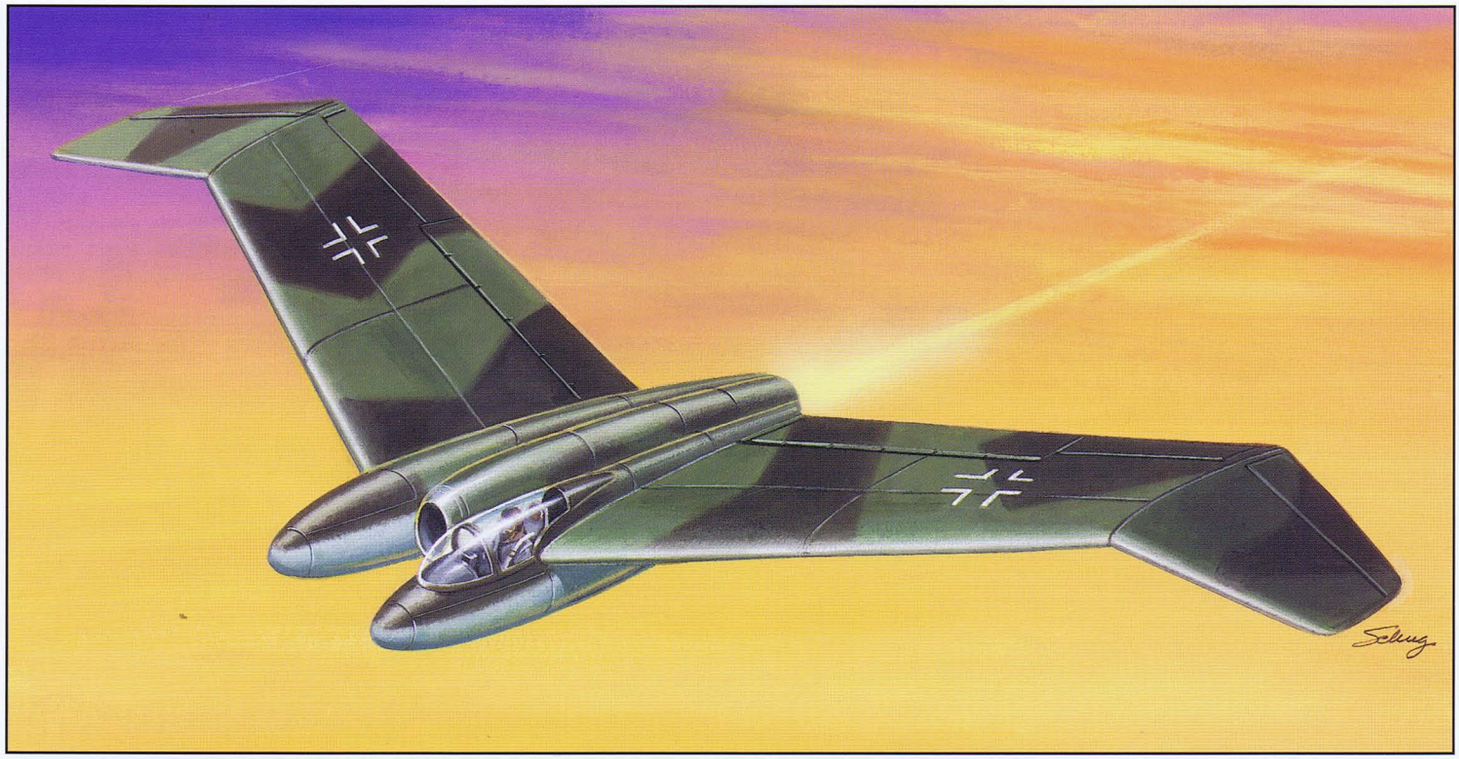
Cross-section "E" - Gear assembly



Cross-section "F" - Electronics



Heinkel He P 1078-04 B
July 18, 1945
1 x HeS 011 A



Opposite and above: The He P 1078-04B was a single-seat tailless day fighter project in which the pilot sat in the port nacelle while the aircraft's armament and nosewheel were contained in the starboard nacelle. At the aircraft center was to be a single HeS 011 A-1 turbojet.

studies) department was of the opinion that the development of the Ju EF 128 could be finalized within six months.

In May, 1945, immediately following the German surrender, Soviet forces occupied the Junkers facility at Dessau and, under Soviet supervision, Junkers engineers compiled a short description for the Soviets. According to this report, the Ju EF 128 day fighter had a wingspan of 30.2 ft (9,20 m), a length of 27.2 ft (8,30 m), and a takeoff weight of 10,800 lb. (4,900 kg). The aircraft's armament was to be installed on both sides of the cockpit and within the wing roots. The fully equipped aircraft was to have a range of approximately 1,118 miles (1,800 km).

After the Russians had evaluated the many Junkers projects, the Soviet engineers terminated further development work on the EF 128 because of a lack of manufacturing capacity, and instead focused their efforts toward development of the single-seat Junkers EF 126, and two advanced bombers, the Ju EF 131 and EF 132 design studies (see Vol. 2).

Volksjäger Fighters

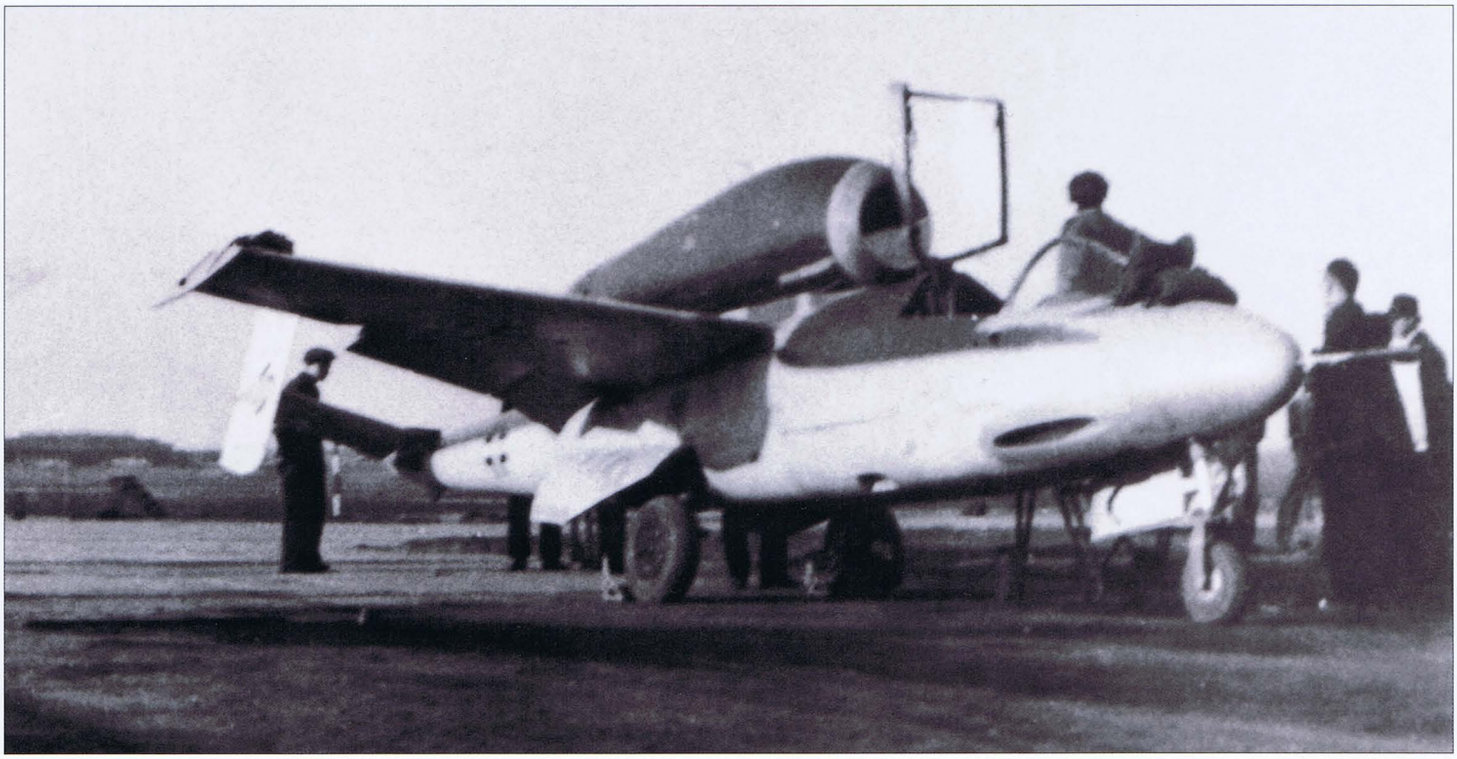
The overwhelming Allied air power and devastating air raids carried out over Germany after 1943 had made it clear to the Luftwaffe leadership that large numbers of advanced piston-engine fighters, such as the Fw 190D, Ta 152H or Bf 109K, in conjunction with the new jet fighters, must be manufactured.

Since the development of the Me 262 A-1a jet fighter was more time-consuming than originally anticipated, there was a pressing need for a light, fast, single-jet fighter capable of being built in large numbers, using non-strategic materials. One of the first proposals to meet this requirement was the Heinkel He P 1073, which was a turbojet fighter project to be powered by an HeS 011. It was similar to , but not identical with, that which later became the He 162 Volksjäger (People's fighter). Several of its features were adopted, however, for a low-cost simple fighter aircraft, when on September 8, 1944, the Technische Amt announced a competition for a so-called Volksjäger. Since Heinkel had already evolved a similar project some months earlier, a design proposal was quickly drafted and submitted to the Technical Office within a matter of days. After a short assessment, the Heinkel design was accepted and a production contract awarded on September 29, 1944, without any prototype having been completed or tested.

Concurrently, several other aircraft manufacturers were also engaged in the design of a Volksjäger. One of the early design studies proposed was the Arado E 580 TL-Jäger, a single-seat fighter powered by one BMW 003 turbojet, which was remarkably similar to the Heinkel project. The airframe was to be made from steel, combined with wooden wings and tail assembly. A tricycle undercarriage, with wide-track main wheels, was incorporated. Interestingly, the turbojet engine mounted snugly on top of the fuselage, with the rear portion of the cockpit canopy protruding into the air-intake. It had a length of 25.25 ft (8,00 m), and a wingspan of 25.5 ft (7,75 m). Armament was to consist of one or two MK 108s with 60 rpg. A top speed at ground level of 429 mph (690 km/h), and 466 mph (750 km/h) at 32,800 ft (10,000 m), had been calculated.

Because neither the air-intake arrangement nor the estimated performance were acceptable, Technisches Amt and OKL rejected further development of the Ar E 580 design, a general description of which was finalized on September 12, 1944.

Another proposal by Focke-Wulf was the Fw Volksflugzeug (People's airplane) powered by one BMW 003A, and developed in conjunction with several other designs put forward by all major aircraft manufacturers. However, Focke-Wulf engineers considered the BMW 003 to be lacking in power and not likely to be fully reliable. They therefore tried to introduce an advanced model - the HeS 011-powered aircraft, the Flitzer, or alternatively, one of the Ta 183 variants. However, a Volksflugzeug was designed by Kurt Tank's engineers to fill the gap until these more advanced aircraft



could become available in 1945. As with the other "people's fighter" developments, the Focke-Wulf Volksflugzeug was armed with only two MK 108s. The design submitted had a wing area of about 145 sq ft (13.5 sq m) and takeoff weight was 6,933 lb. (2,900 kg). Due to the limited power of the turbojet, a top speed of only 466 mph (750 km/h) was anticipated. Endurance at ground level was calculated as only thirty minutes, rising to forty-five minutes at full thrust at 32,800 ft (10,000 m). A maximum ceiling of 34,450 ft. (10,500 m) was calculated. The project called for two possible wing plans. One featured a straight leading-edge wing, while the favored design called for a 35-degree swept wing. The Technical Office was not impressed with the Focke-Wulf entry, and it was quickly rejected.

Junkers engineers also participated in the competition, but the Ju Volksjäger[16] was not accepted by the RLM officials. With the exception of a few photographs, nothing else concerning the interesting project has survived.

At Bad Eilsen, where Focke-Wulf's development department was located in 1944, another proposal had been advanced by October, 1944. Known as the Fw Volks-Flitzer, it differed little from the Fw 226, the HeS 011-powered Flitzer.

By September 18, 1944, design of the Focke-Wulf Volks-flitzer had been finalized. Its maximum operational speed was 478 mph (770 km/h) at 19,685 ft. (6,000 m). The BMW 003 turbojet permitted a maximum ceiling of only 35,100 ft. (10,700 m). The range was limited to about 375 miles (600 km). Approximately 1455 lb. (660 kg) of fuel would be carried, much inferior to that of the HeS 011-powered Flitzer, which had a range of about 620 miles (1,000 km). At ground level, the Volksflitzer's range dropped to only 218 miles (350 km). Standard armament was to consist of MK 108s, while general equipment was not much different from the other Flitzer versions. Since the Luftwaffe had by now decided in favor of the Heinkel He 162 Volksjäger, and Focke-Wulf's production capacity was already fully taken up turning out Fw 190 and Ta 152 fighters, Kurt Tank's team focused their efforts on the Ta 183.

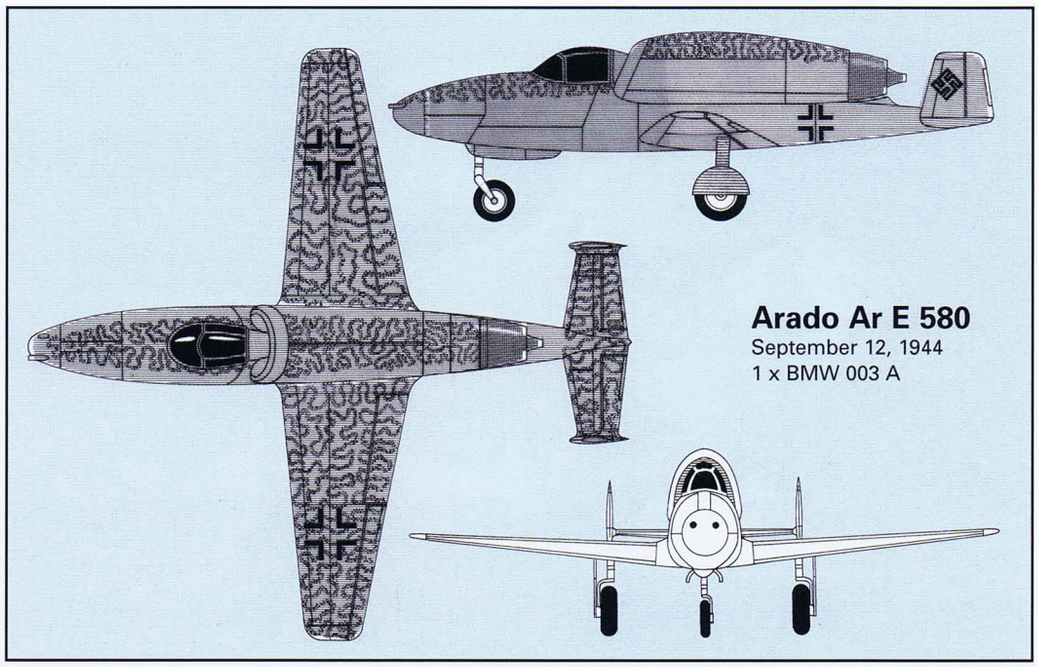
16 Probably it was either the Ju EF 123 or 124.

Above: This He 162 A-2, W.Nr. 120001, was the first example completed at Heinkel's Rostock Marienehe and is shown being prepared for its first flight on March 25, 1945. The two sandbags in front of the windscreen compensate for the weight of the still to be installed two MG 151/20 cannon.

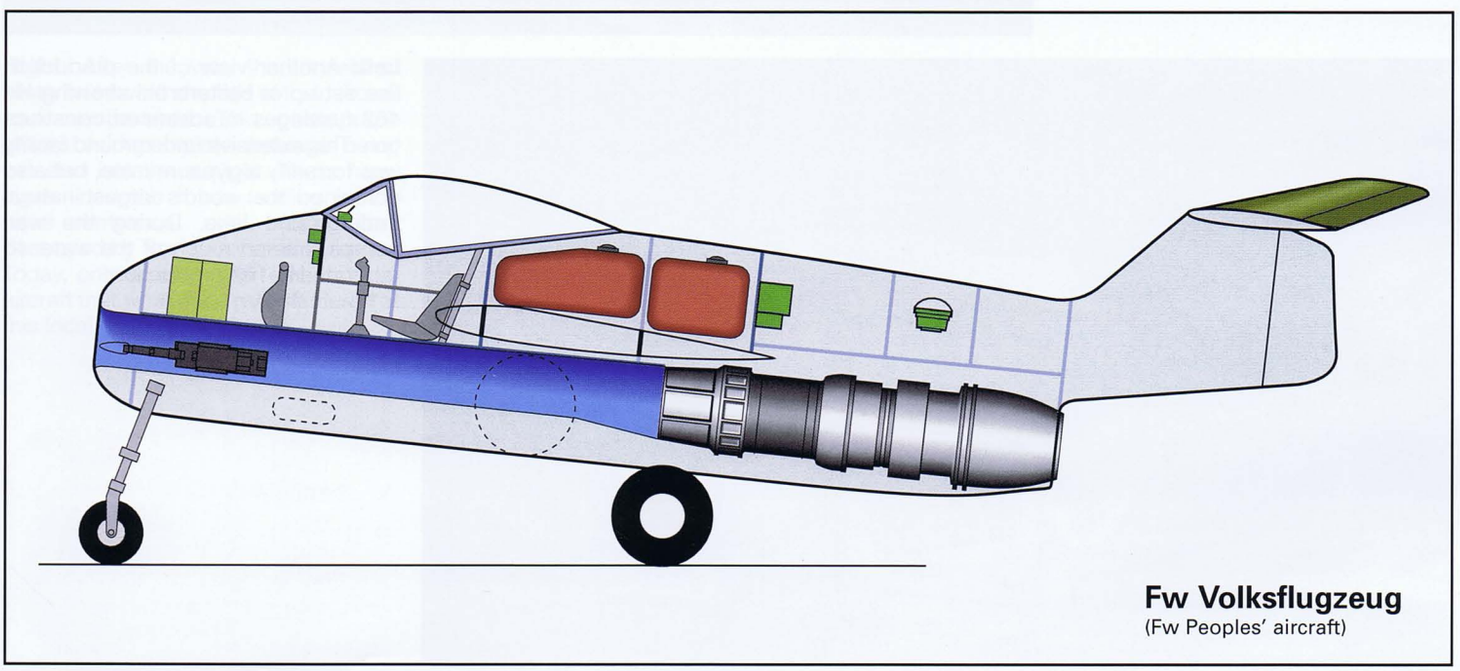
During 1944, Dr. Richard Vogt and his staff at Blohm & Voss created a light-weight fighter, the BV P 211.01, to be powered by the BMW 003A turbojet. It featured sweptback wings, a simple fuselage built up from a tubular steel spar from which the turbojet was suspended. It was to be armed with two MK 108 cannon and a clear vision canopy. However, when on Sunday, September 10, 1944, Dr. Vogt received a telex communicating brief details of the design competition, it was his first indication of the RLM's requirement. The telex requested him to submit a project study within a period of three to five days. Two days later, the RLM set a deadline of September 14, 1944, for the presentation of all necessary details. After carefully reviewing the specification, Dr. Vogt and his team elected to further simplify the P 211. The result was the BV P 211.02. An official meeting was to be held at the Air Ministry on the same day, when all proposals submitted were to be discussed. The RLM appointed Heinkel's director, Karl Franke, to appraise all the design proposals submitted by firms of Arado, Blohm & Voss, and Messerschmitt. Despite the fact that the Heinkel P 1073 did not meet the official specifications, especially because its endurance was limited to a mere twenty minutes, Heinkel's proposal was the absolute favorite.

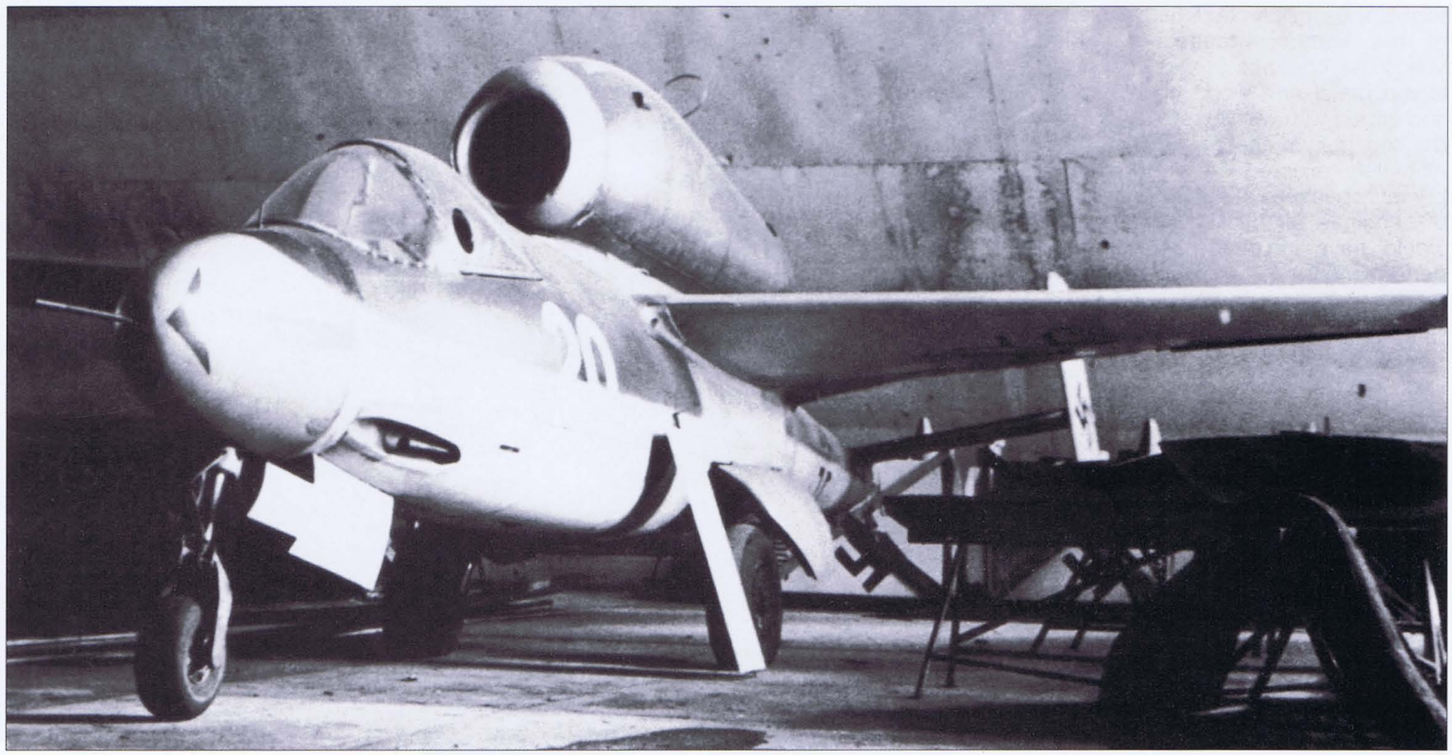
Although the Blohm & Voss P 211.02 apparently was the most promising design, Herr Franke and RLM officials inflated the Heinkel proposal and as a result, decided to terminate development of all other designs. Flieger-Stabsingenieur Heinrich Beauvais, the officer responsible for all new fighter developments, did not agree and stated that the decision had clearly been ill-advised. On September 30, 1944, the RLM canceled further work on the BV P 211 after Generalstabsingenieur Rolof Lucht took the unprecedented step of deciding in favor of the mass production of Heinkel's people's fighter, without testing even a single flying prototype.

Right: The small Arado E 580 was one of the early contenders for the Volksjäger contract. It was to be of mixed metal and wood construction and armed with two 30 mm cannon in the top half of the nose. The RLM ultimately rejected the Arado entry primarily because of the placement of the engine's air intake, which it felt would have inhibited the aircraft's performance.

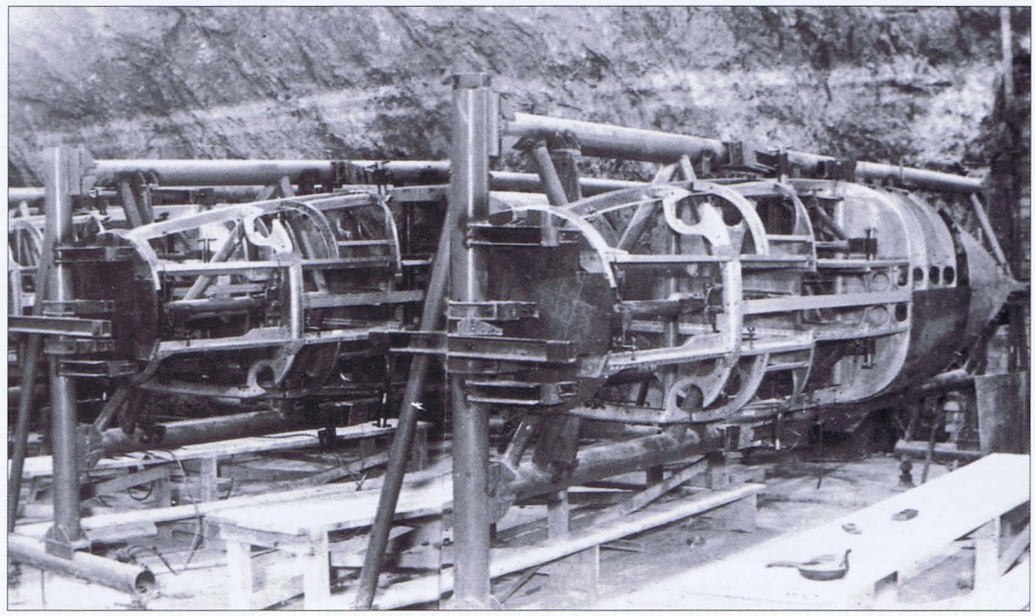


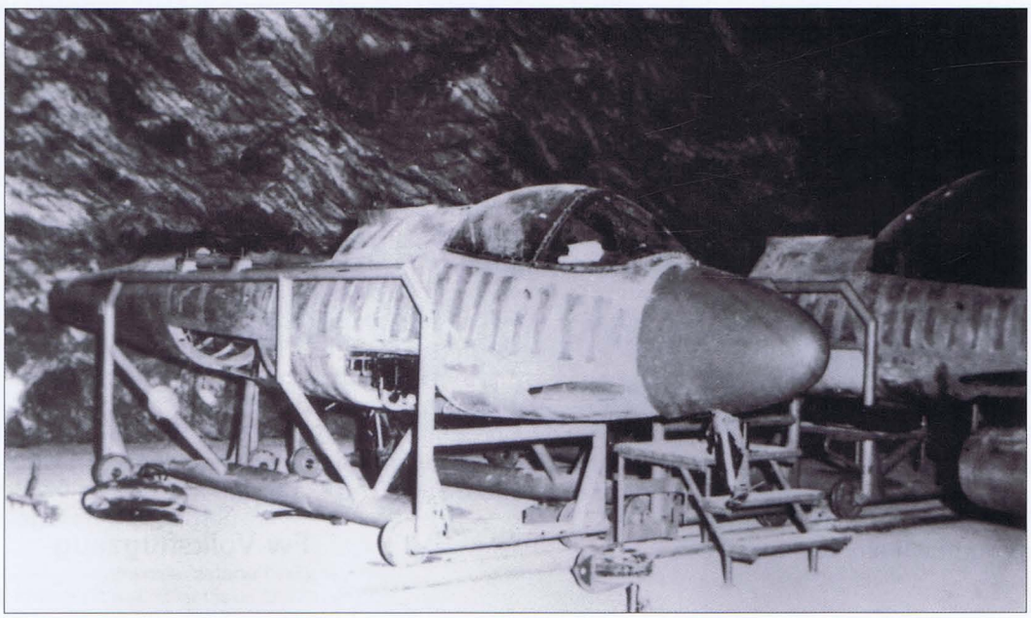
Left and Below: Focke-Wulf's entry into the Volksjäger competition was their Fw Volksflugzeug of September 20, 1944. This project was tendered with either a sweptback wing mounted at mid fuselage, or alternatively, a wing with a straight leading edge. Powered by a BMW 003 and armed with two 30 mm MK 108 cannon, the aircraft would have had an all-up flying weight of 6,393 lb (2,900 kg).



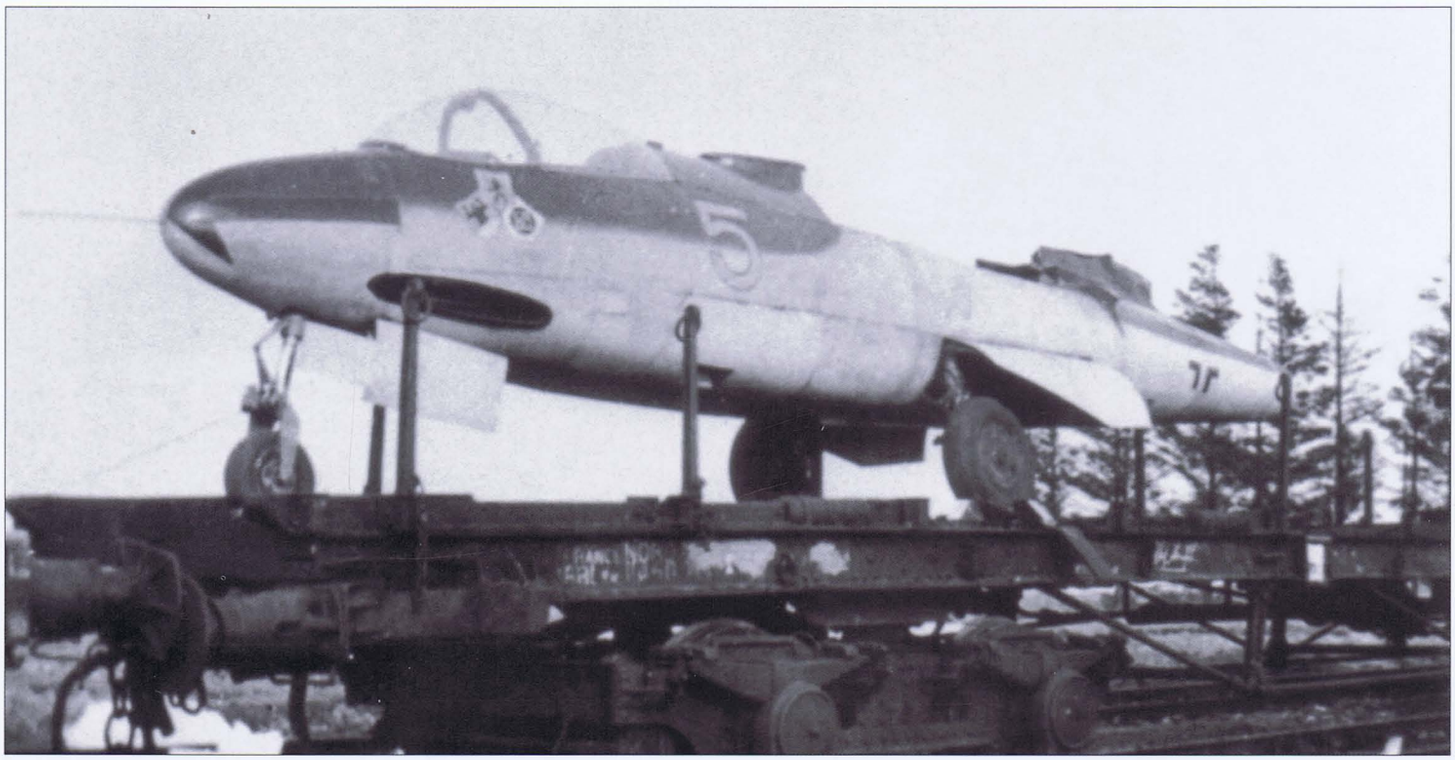


Above: One of the many He 162 A-2s captured by British troops at Leck airfield is this example, white 20. The distinctive camouflage pattern identifies this example as having been built at Heinkel's Marienehe facility on the Baltic. **Right:** A close-up view of He 162 fuselages being constructed on their jigs within Heinkel's southern underground facility at Hinterbrühl near Mölding, in the spring of 1945. This view shows the lower part of the forward fuselage.



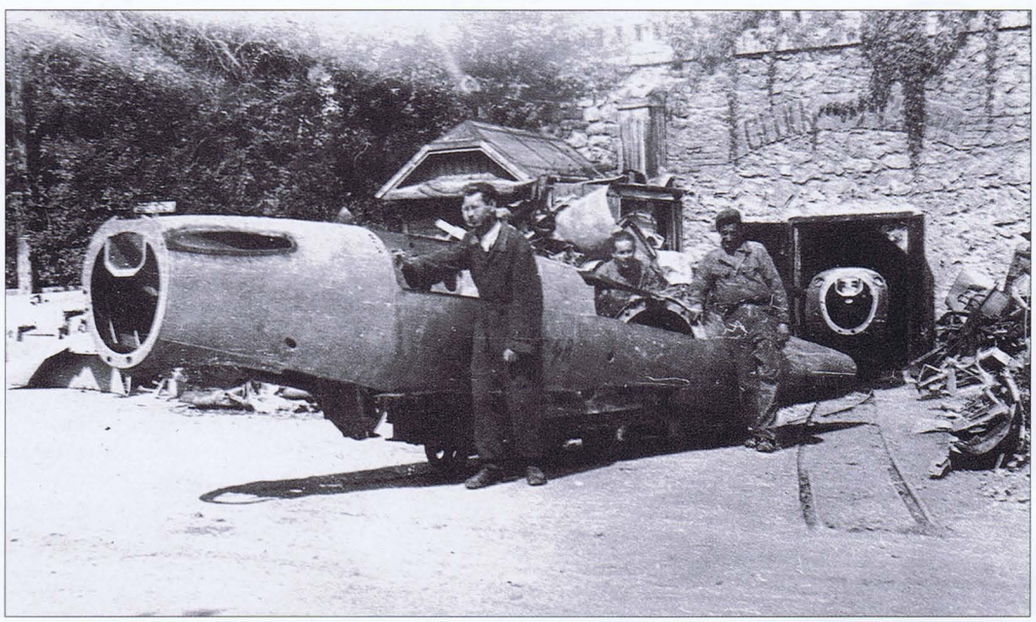


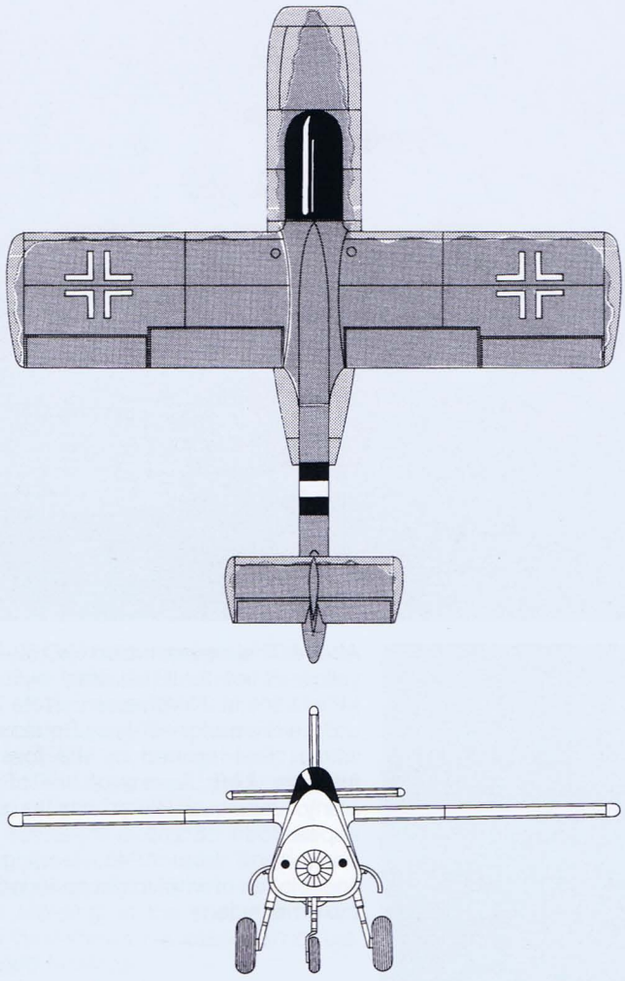
Left: Another view of the production line set up at Hinterbrühl showing He 162 fuselages in advanced construction. This extensive underground facility was formerly a gypsum mine, but also contained the world's largest natural underground lake. During the war, pumps drained much of the water to facilitate He 162 production.

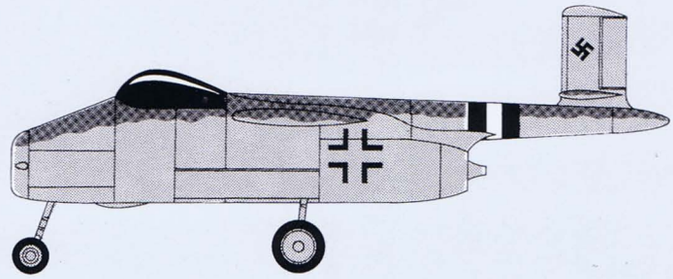


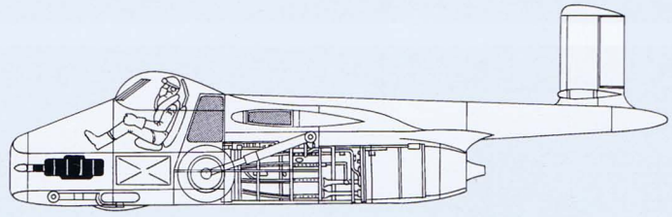
Above: This disassembled He 162 A-1, yellow 5, of 3./JG 1, was built by Mittelwerk at Nordhausen. Note the unit emblems for all three Squadrons within JG 1 painted on the forward fuselage. **Left:** A view of one of the many tunnels at Hinterbrühl as they appear today. Some of these are still bricked off from 1945, leading to speculation of what might be found on the other side.

Right: After the war, the tunnels at Hinterbrühl were emptied of their aircraft and components. This photograph shows an incomplete fuselage being wheeled into the sunlight. These fuselages lined the roads leading to the mine entrance until they were destroyed by Soviet occupation forces. Today, only small traces remain of the aircraft that were once manufactured at this location.

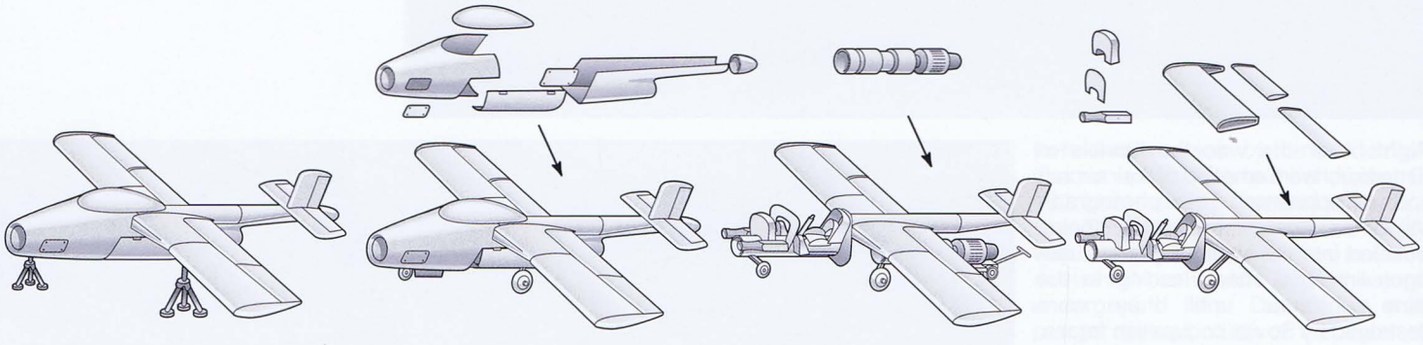








BV P 211.02
September 29, 1944
1 x BMW 003 A



Bauplatz 8

Funktionsprobe

Maschine aufbocken
Fahrwerk, Bugrad, Ruder,
Landeklappen, Steuerung,
Elt. - Anlage usw. erproben.

Bauplatz 7

Verkleidungen anbauen

Rumpf- und Triebwerksverkleidung
anbringen und verbrauben.

Bauplatz 6

Triebwerk - Einbau

Einfahren, anschließen
Betriebsstoffanlage und
Bediengestänge,
Rohre und Kabel anschließen.

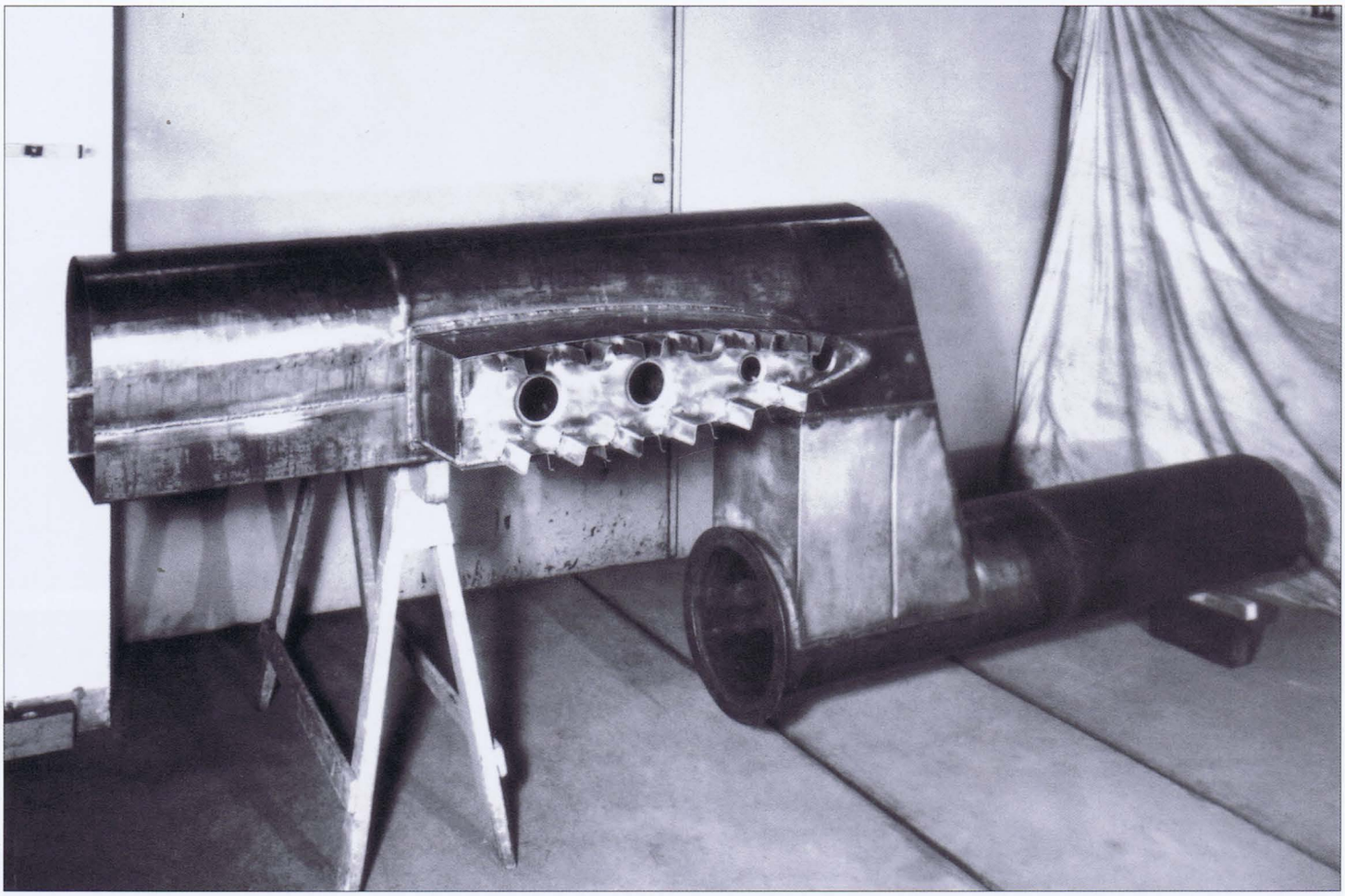
Bauplatz 5

Außenflügel anbauen

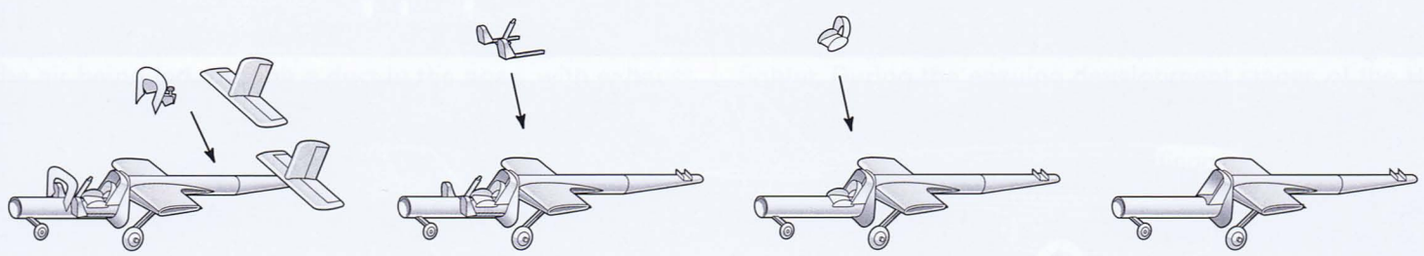
Landeklappen einbauen und
anschließen.
Verkleidung anbauen, Querruder und
Steuerung

Bewaffnung einbauen

Waffen, Panzerplatte, Munitionskästen
einbauen. Leitungen anschließen,
Sauerstoffanlage anschließen.



This page and opposite: The BV P 211.02 was an extremely simple aircraft design which easily fulfilled the Volksjäger specification, yet because of politics and other considerations, it lost out to Heinkel. The photograph above shows the two-piece steel core of the fuselage. The jet intake pipe is the lower component while the top section forms the beginning of the fuselage boom and the wing attachment point. The 8-stage assembly sequence for the BV P 211 is graphically shown in the illustration below. Compare this version with the earlier BV P 211.01 shown on page 46.



Bauplatz 4

Hecklertwerk anbauen

Ruder anschießen

Gerätebrett m. Bedienbank einbauen. Geräte Bedienhebel Sauerstoffanlange etc. sind bereits montiert, werden nur angeschlossen. Kabel verlegen und anschließen.

Bauplatz 3

Steveerung einbauen

Knüppel u. Fußpedale einbauen, Umlenkhebel anbauem Stoßstangen einführeren u. anschließen.

Ausrüstung u. Geräte

die nicht im Gerätebrett u. Bedienbank eingebout Werden, anbuen.

Bauplatz 2

Betriebsstoff - Anlage einbauen

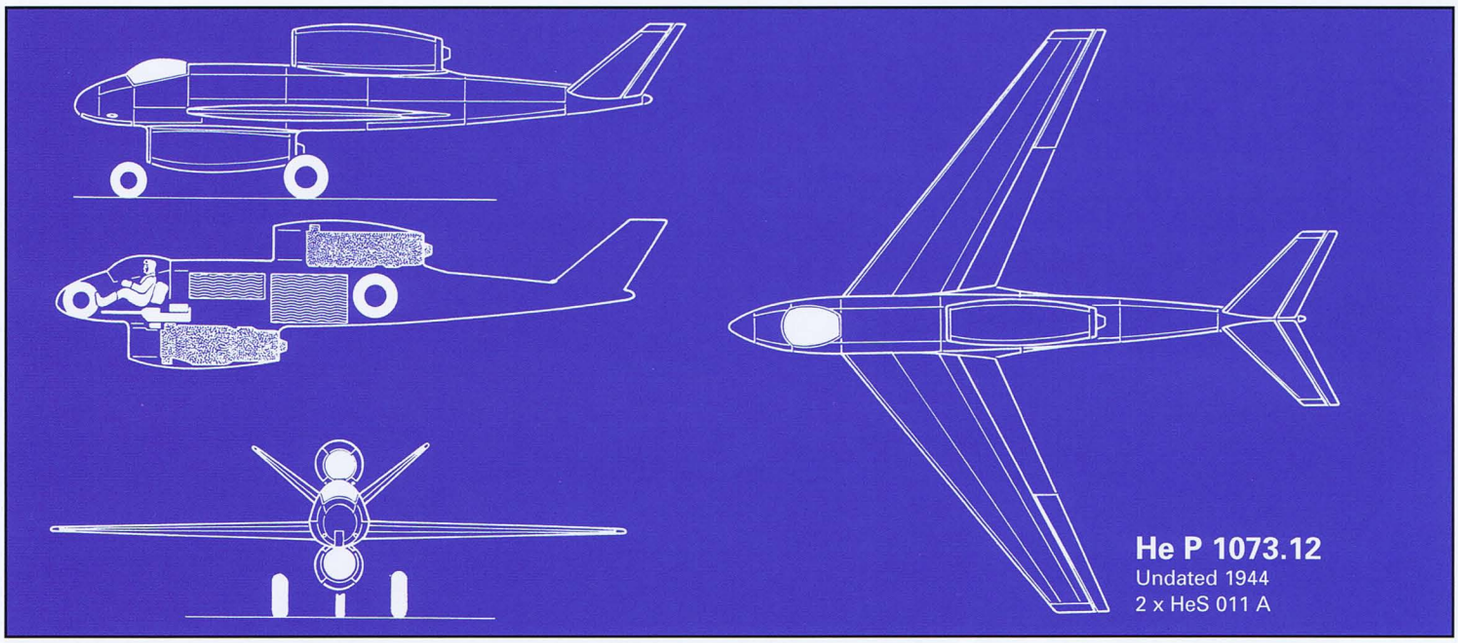
Rohre u. Schläuche verlegen Ventrile u. Geränbauen u. anschließen

Führersitz einbauen.

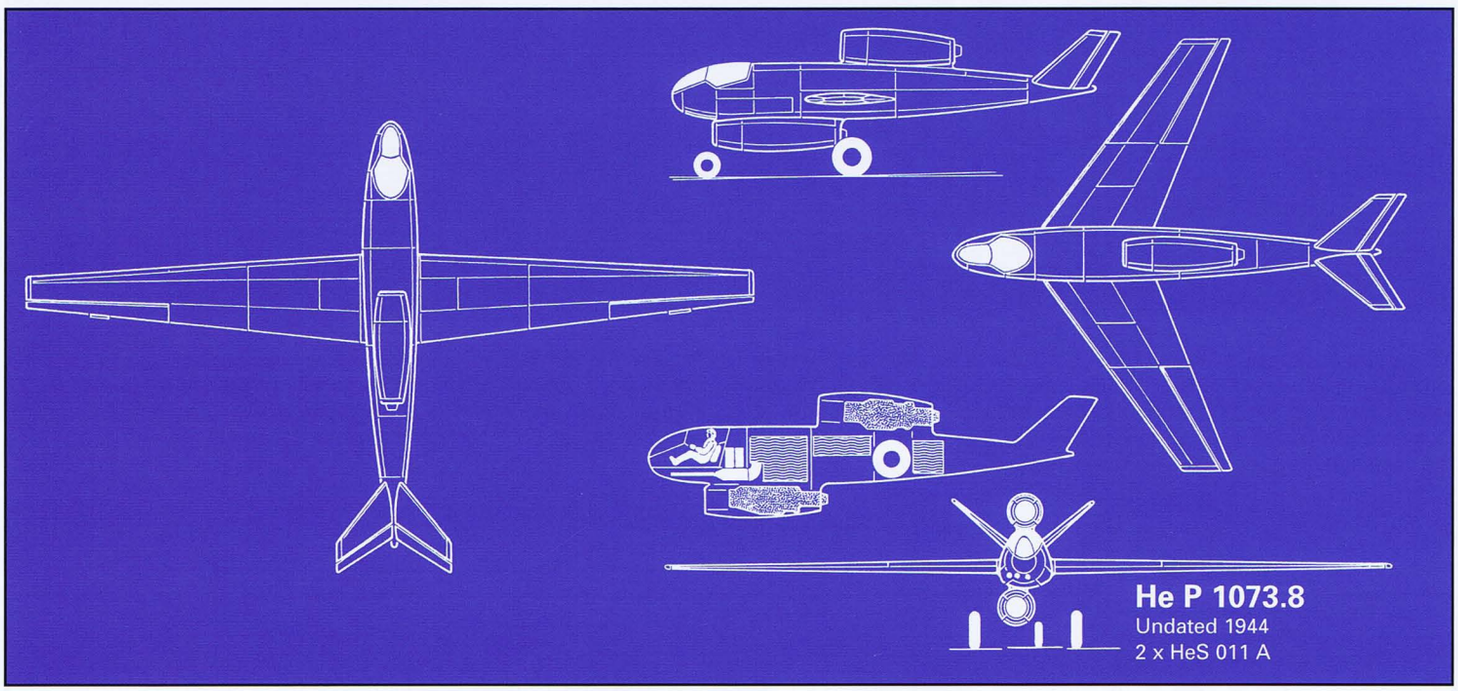
Bauplatz 1

Fahrwerk u. Bugrad einbauen

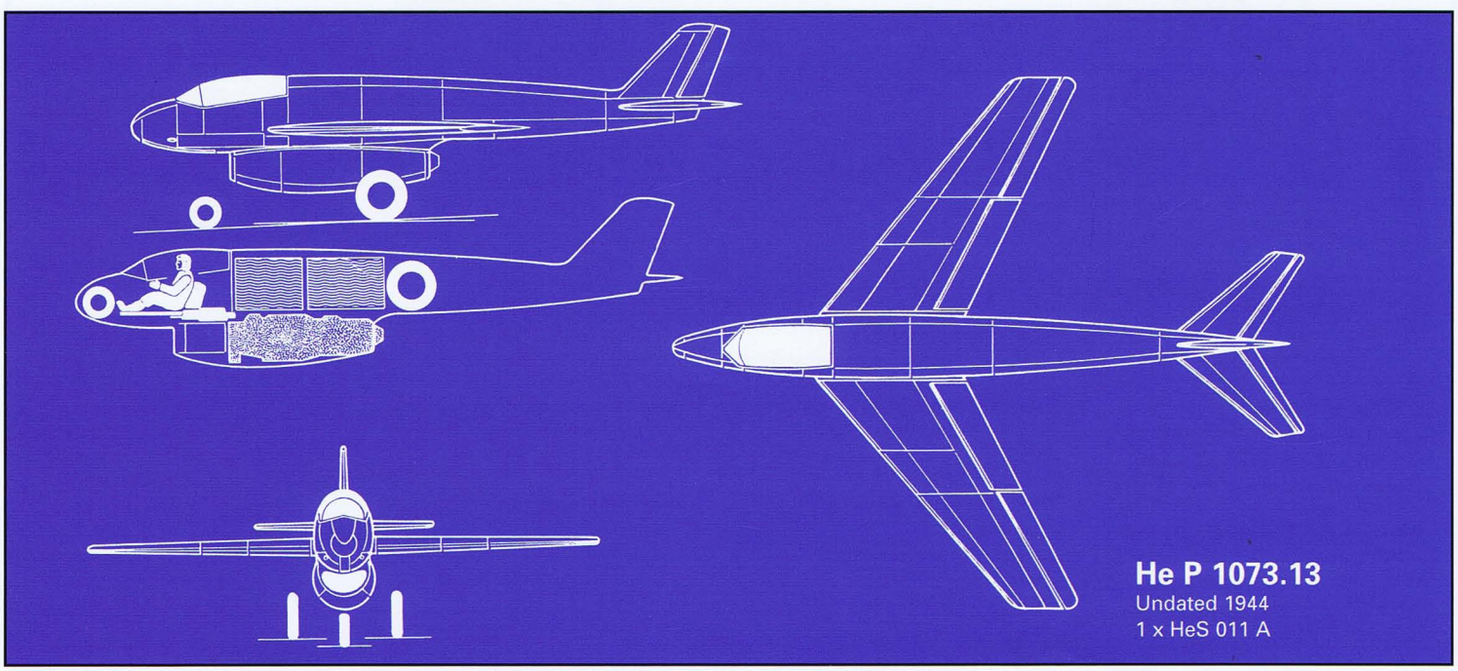
Wagen günstiger Arberts höme Fahrwerk ha...
Oeldruckanlage einbauen...



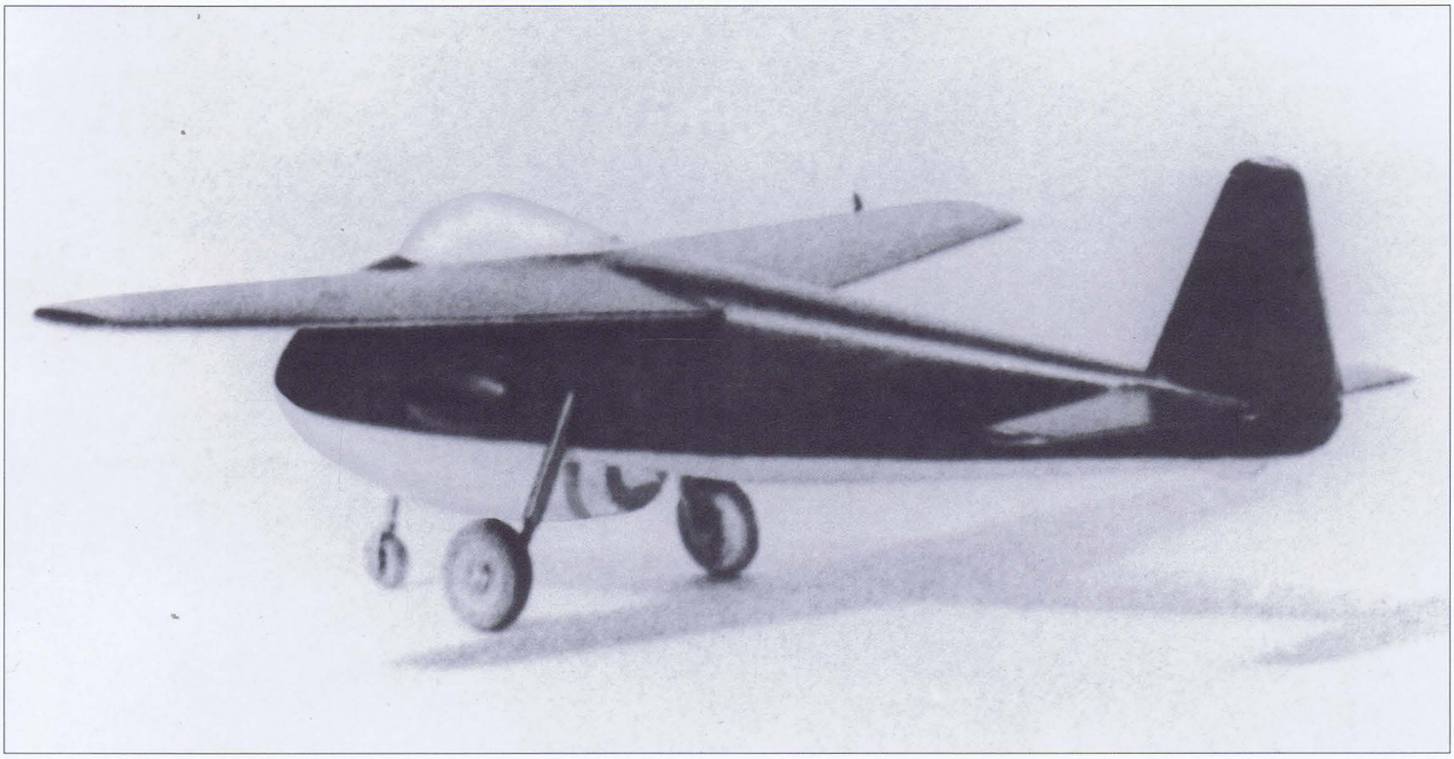
He P 1073.12
Undated 1944
2 x HeS 011 A



He P 1073.8
Undated 1944
2 x HeS 011 A



He P 1073.13
Undated 1944
1 x HeS 011 A



Above: A Junkers factory model of their unsuccessful entry for the Volksjäger specification, probably the Ju EF 123 or 124. A simple shoulder wing design, it resembled the Blohm & Voss entry but with the turbojet mounted well forward not unlike the older Focke-Wulf project shown on page 30.

Despite the cancellation of the BV P 211, the Aerodynamische Versuchsanstalt, Göttingen, continued wind-tunnel tests with the central air-intake duct design. This institution ascertained that there were no disadvantages; in particular, no vibrations or other undesirable effects were observed. Since the sweptback wing version was more complex, further development of the BV P 211.01 was terminated and all efforts concentrated on the second proposal.

The BV P 211.02 featured simple straight wings, while the main fuselage member was a special bent tubular former, from which the turbojet engine was suspended. The former extended rearwards to serve as mounting for the simple tailplane. The BMW turbojet was installed aft of the cockpit, the air being fed through a duct in the nose, with exhaust being discharged just forward of the tailplane assembly. The armament of two MK 108 guns (60 rpg), was to be mounted in the nose on either side of the intake duct. The mainwheels of the tricycle undercarriage retracted into the fuselage as did the nose wheel, which had to rotate through 90 degrees in order to lie flat just beneath the air intake duct.

The performance data, as calculated on September 29, 1944, were as follows: the top speed at 19,685 ft (6,000 m) was 477 mph (767 km/h), with a climb rate of 3,525 ft/min (1,075 m/min) at ground level. At 29,500 ft (9,000 m) 1,230 ft/min (375 m/min) was expected. The light-weight fighter with a length of 26.4 ft (8,06 m), a span of 24.9 ft (7,60 m), and a height of 11.8 ft (3,60 m) possessed a takeoff weight of 7,495 lb. (3,400 kg). Although the performance was expected to be better than that of the He 162, it was felt that Heinkel had a superior manufacturing capacity.

Apart from the Blohm & Voss proposal, Arado and Messerschmitt again presented reworked older designs, which were rejected because of their complicated construction. Focke-Wulf left the competition, since the development staff was now fully occupied with their Fw 226 Flitzer and Ta 183 projects.

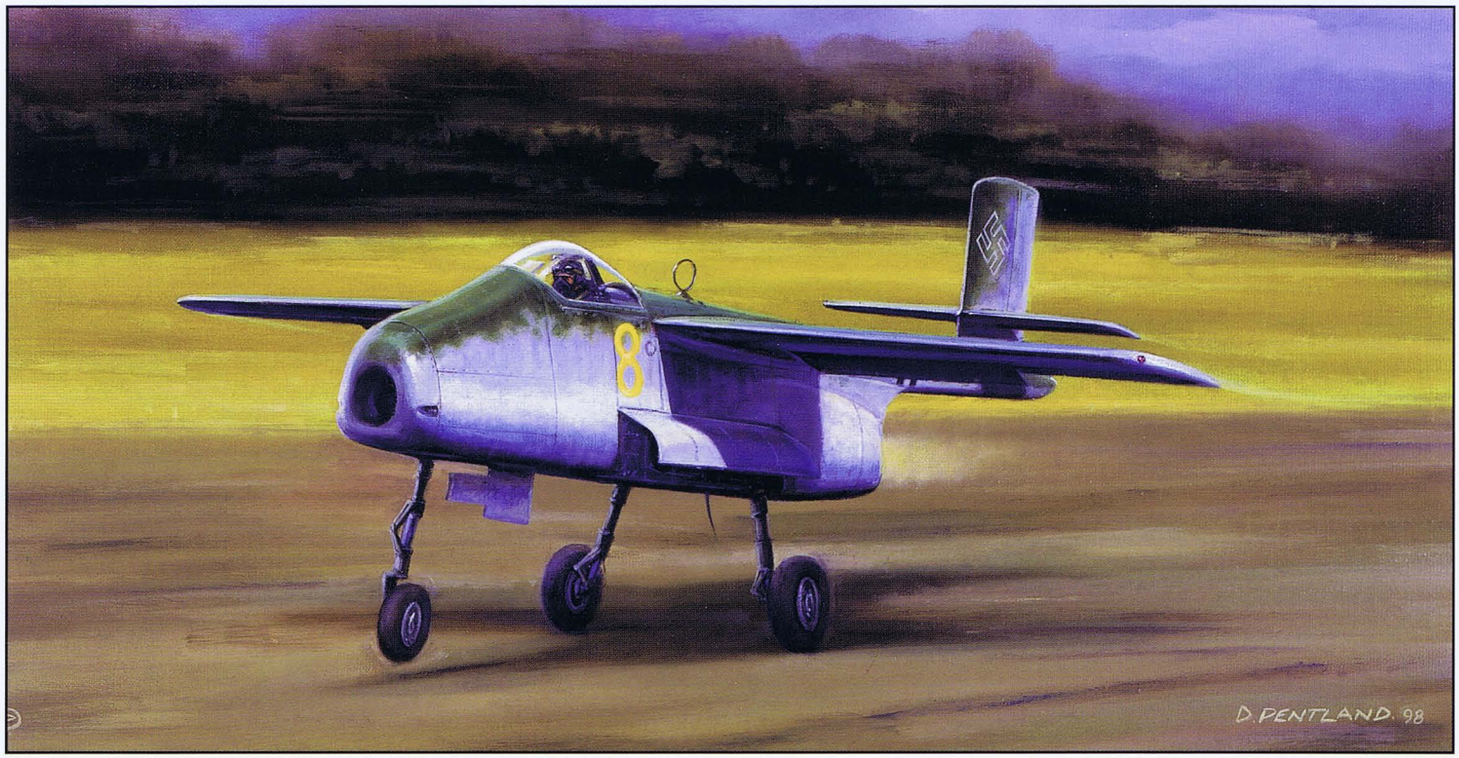
Because of this, the winner of the people's fighter competition was chosen in an unconventional manner, before any of the accepted and usual selection procedures had been initiated.

In June, 1944, a few months before development proposals for a Volksjäger were officially invited by the RLM, Siegfried Günther and a team of experienced Heinkel designers had developed the He P 1073 Volksjäger, a small, single-seat fighter powered by a BMW 003 turbojet. Without waiting for the conclusion of the Volksjäger competition, Oberst i.G. (Col.) Diesing, Chef TLR, leader of the Entwicklungs-Hauptkommission (EHK – chief development committee), Generalstabsingenieur Lucht, and the commanding officer of the Amtsgruppe Entwicklung (development department), Oberst Geist, gave their consent to Heinkel's director, Herr Franke, for the development and production of a single-jet fighter. During the ensuing development stages of the He P 1073, on his own initiative Prof. Heinkel had assigned the RLM GL/C number 500 (He 500) to the project. However, the Air Ministry was not favorably disposed to this activity, and instead allocated the number 162[17] to the fighter which then became officially the He 162.

By the late summer of 1944, several advanced variations of the He P 1073 had been designed. Some were powered by two BMW 003 turbojets and some possessed a V-tail, while others featured conventional tailplanes with only one turbojet mounted on top, or below, the fuselage. It was later proposed that a faster version of the He 162 be developed by fitting a new forward-swept wing, and a modified V-tail[18]. By 1947, at least thirty improved He 162 designs were prepared under Soviet supervision. Because the small size of the single-jet fighter did not lend itself to increased range without radical redesign, further development was eventually terminated.

17 The RLM GL/C number 162 had previously been assigned to Messerschmitt, for their Bf 162 twin- engined high-speed light bomber, which had failed to enter production.

18 As far as is known, none of these projects received any special designation, as none were actually approved for series manufacture.



Above: Aviation artist David Pentland's impression of the BV P 211.02 graphically captures the rudimentary design of this Volksjäger project. Although it was the essence of simplicity, servicing the turbojet would have been more involved than that of the He 162.

By mid-September, 1944, the mockup of the He 162 was finished and accepted in principle by engineers Lucht, Behrens and Scheibe. Heinkel was instructed to alter some fifteen minor details. Despite of the influence of Professor Messerschmitt, and a comprehensive report by Dr. Vogt, the Heinkel Volksjäger was pushed into production. On November 9, 1944, the leader of the SS-Hauptamt (SS headquarters) reported to Reichsführer SS (Reich SS leader) Heinrich Himmler that between one and two thousand He 162s were to be manufactured monthly, essentially by non-skilled and slave workers. By this time, a number of minor problems and difficulties had been successfully overcome.

A secret report by OKL/TLR, compiled during February, 1945, described the aircraft which had just entered flight testing. At the time, only eight aircraft had been completed, most of them undergoing testing and evaluation at Heinkel. It was proposed that some of the small jet fighters should be transferred to Rechlin for service evaluation by the Luftwaffe as soon as possible.

However, many grave shortcomings had come to light during the initial stages of the aircraft's evaluation. The first prototype had crashed during its second flight, December 10, 1944, due to a structural failure. Also, a number of technical problems caused by critical supply shortages, as well as an insufficient number of airframes, made it impossible for Heinkel to satisfy the OKL demands for more prototypes and pre-production aircraft by 1945.

Since it seemed quite impossible to produce all the required BMW 003 turbojet engines, only about one hundred He 162s had been delivered by March, 1945. It was therefore decided to try installing the larger Jumo 004B, E or D turbojets onto the small Heinkel fuselage. The development of a Jumo 004-powered He 162 began in late 1944. By February, 1945, the first experimental aircraft (He 162 M12, W.Nr.220018) with the Jumo 004 turbojet, was rolled out near Vienna, and test flown. However, the supply of Jumo 004s was insufficient to equip even the Me 262s which were being produced, without diverting these engines to the untried He 162. Another conversion was the proposed installation of the more powerful Jumo 004D, which would permit a top speed of 596 mph (960 km/h), a range of 447 miles (720 km), and an endurance of 57 minutes. The use of one Jumo 004E was also considered; however, the estimated performance of the He 162 with the Jumo 004D appeared to be superior to that with the E-type. With the exception of possibly one experimental engine, no Jumo 004E turbojets were produced.

Another alternative was the installation of the more powerful HeS 011 A-1 turbojet however, only twenty-six of these experimental engines had been built by March, 1945.

Despite all the difficulties, the first pre-production HeS 011 A-0 engines were assembled at Stuttgart-Zuffenhausen. The He 162 with an HeS 011 however, was never built. Only a mockup had been constructed by the end of the war.

The last amended aircraft production schedule specified more than five hundred He 162s to be manufactured in April, 1945 — an absolutely impossible demand.

Modifications to the fuel system were also planned. Because of the insufficient output of B4 high-octane aviation fuel[19], RLM officials in particular insisted on using J2 jet fuel. This fuel was mainly destined for Me 262 and Ar 234 operations. Due to the overall situation, it was not possible to finalize the change.

Although many Luftwaffe officers would have preferred to see any He 162 production curtailed, the He 162 A-1 (with two MK 108s) and the A-2 (with two MG 151/20s) finally entered production in 1945. At Schwechat, near Vienna, about eight aircraft were completed, and more than twenty were assembled in Mödling, while about 55 were turned out at Marienehe and Theresienfeld. Additionally, Junkers built about fifteen He 162s, and between five and ten were

19 B4 aviation fuel was rated at 87 octane.

Above: An American Army officer tries out the seating in this He 162 A-2, white 4, formerly operated by 1./JG 1, after the aircraft had been transported to Kassel. Kassel was a collection point for priority aircraft intended for possible transfer to the United States. With its BMW 003 mounted above the fuselage, servicing or replacing the jet was a simple task.

delivered from Oranienburg. A small number of He 162s may also have been completed at the secret underground Mittelwerke facility at Nordhausen, under the direction of Dr. Kammler and the SS.

The first aircraft were delivered to the Fliegertechnischen Schulen (Luftwaffe technical schools) at Bayreuth, Fassberg, and Parchim. Also, Chef TLR, Fliegerüberführungs-Geschwader 1 (aircraft ferry wing – FlüG), the replacement ferrying wing, Ergänzungs-Fliegerüberführungs-Geschwader, and the Stab (staff flight) and first Gruppe of Jagdgeschwader 1 received some aircraft. Most of the Volksjäger were operated by JG 1, which flew the Heinkel jet in combat between April 25 and May 6, 1945. When British forces reached Leck airfield in northern Germany, about thirty airworthy He 162s were captured intact.

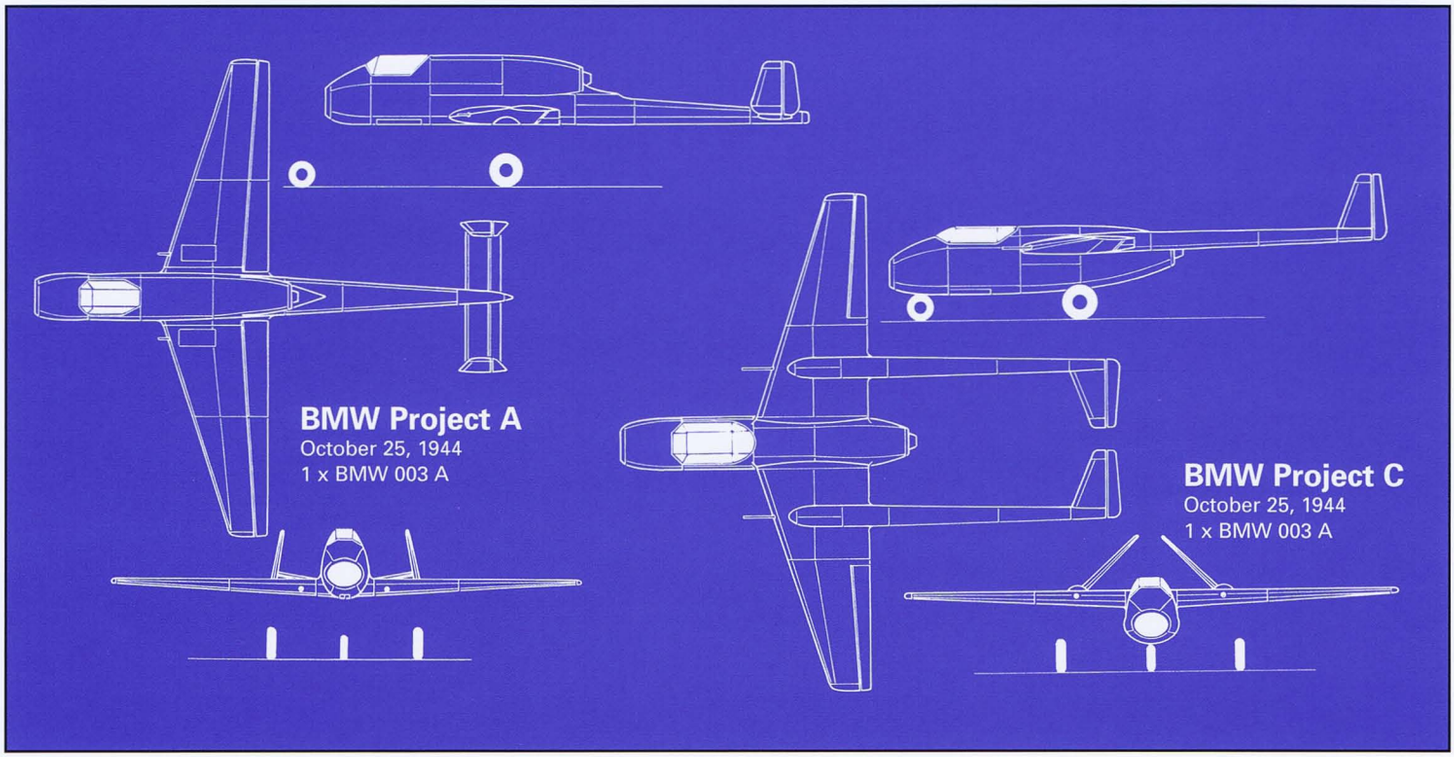
In spite of all the setbacks which took place during the closing weeks of the war, several advanced proposals involving the He 162 had been compiled. Among them was an He 162 mit Rohrblock-Bewaffnung (barrel block armament). This device, SG 118, was a modified SG 117 weapons system consisting of seven MK 108 barrels in a weapons container. Also,consideration was given to fitting the Sondergerät Rohrblocktrommel (special barrel block drum device) into the fuselage of the He 162 as a replacement for the two nose guns. This "special device" was similar to the SG 117, but consisted of three units of seven barrels each revolving around a fixed axis. Another modified Volksjäger armament was proposed in 1945: a Raketen-Automat (automatic rocket firing device – RA 55) with fifteen R4M missiles to be fitted into each weapons bay. The 15er Wabe (15 rounds honeycomb) was never used operationally, only one experimental device being eventually tested at Tarnewitz. Thus, most of the Volksjäger were equipped with the inferior armament of two MG 151/20s because of the non-availability of more powerful weapons.

Another design proposal for a light-weight jet fighter was evolved by the aircraft division of the Bayerische Motoren Werke GmbH as the BMW Strahljäger (TL-Jäger) mit BMW 003A. An internal memorandum dated October 25, 1944, submitted to the firm's Director Bruckmann, stated emphatically that technical data indicated that a BMW 003-powered Volksjäger was not the proper solution for defending the Reich against Allied bomber and fighter aircraft. But by late 1944, such words fell on deaf ears.

Nevertheless, in the meantime, BMW had worked out a detailed design study, presented as the BMW TL-Jäger mit BMW 003A, which consisted of five different layouts with alternative wings.

These proposals, designated Ausführung (version) A and B, were compiled in early November, 1944. Both were highwing aircraft with the single BMW 003A turbojet carried in the lower fuselage. Pressurized cabins, with either a normal upright seat or a prone position for the pilot, were investigated. Two wing versions were proposed, one having an area of 161.5 sq ft (15 sq m), and the second an area of only 129 sq ft (12 sq m). Because of the narrow fuselage, the fixed armament was fitted in the wings close to the wheel wells. The air duct was bifurcated to permit the nosewheel to retract rearward into the fuselage. The two designs had a conventional central tail. Performance, however, was rather poor, with an anticipated maximum speed of about 460 mph (740 km/h), while range at a combat altitude of about 36,000 ft. (11,000 m) was around 497 miles (800 km).

The highwing Ausführung C was also powered by one BMW 003A turbojet and was fitted with a tricycle undercarriage, but differed from versions A and B by its twin-boom layout with a redesigned fin and rudder. The heavy armament of two MK 103s or MK 213s was to be installed in the boom roots. The jet engine was moved into the enlarged upper fuselage, while a large self-sealing tank was installed under the BMW 003 jet unit.



Another single-seat TL-Jäger mit 1 BMW 003A was proposed by BMW in November, 1944. It was a low-wing aircraft with a central air-intake and a turbojet engine in the upper fuselage. The pilot sat in a pressurized cockpit over the curved intake duct. The nosewheel retracted rearwards into the fuselage, the mainwheels into the wing roots and fuselage. Compared with Ausführung C, the alternative proposal had a conventional twin-tail arrangement similar to the He 162's.

An advanced version of these light-weight fighters, the BMW TL-Jäger mit 1 HeS 011-Triebwerk was developed by Herr Huber of BMW's Abteilung für Enwicklungsstudien (development studies department), in October, 1944, near Munich. There was little difference between the new design and the Ausf(hrung A/B, but power was to be supplied by the HeS 011 turbojet with resulting improved performance. The pilot was seated in an oval fuselage between two fixed forward-firing 30 mm weapons. The circular air-intake took up the space below the cabin, feeding air to the powerful HeS 011 jet mounted below the center fuselage. Redesigned sweptback wings and a single vertical tail were other design features. General equipment, as well as the undercarriage, differed little from earlier BMW designs prepared before the end of September, 1944.

None of these projects were realized, due to lack of production capacity. They were abandoned when the Jägerstab Entwicklungshaupt-Kommission (fighter staff chief development committee) and the OKL made their decision in favor of the He 162.

Pulsejet and Ramjet Fighters

Between 1942 and 1944, a series of tests with high-speed Pulsejet[20] and Ramjet powerplants had been carried out with promising results. At Bad Eilsen, Focke-Wulf engineers were looking for a reliable method to equip piston-engine fighters with two ram-jets attached to the wing tips. The project received the designation Fw 190 als Jagdflugzeug mit Strahlrohr (fighter with pulsejet). The project was eventualy canceled because development seemed to be too costly. This was only one of the many novel ideas for improved propulsion systems submitted to the RLM and the Jägerstab.

Included among these proposals were two of Professor Alexander Lippisch's designs, the Li P 01-113 and Li P 01-115, which required rocket assisted takeoff (RATO) systems to become airborne. Apart from compiling detailed design descriptions, nothing further was done about these projects.

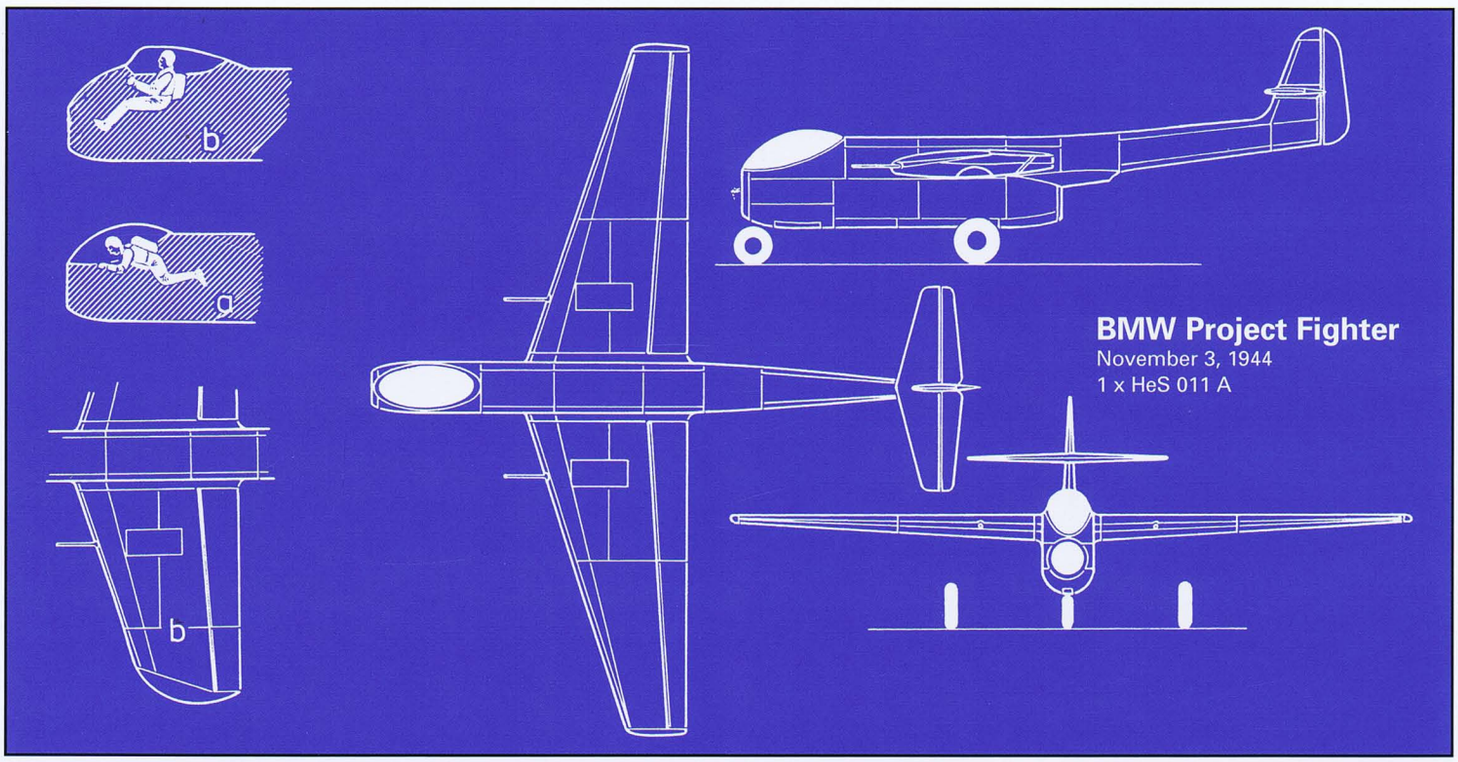
Heinz Stöckel, another German designer, submitted several versions of his Rammrakete mit zusätzlichem Lorin-Antrieb (ramming rocket with auxiliary Lorin ramjet) at the end of August 1944. Initially, he proposed modern swept-back wings, but later Stöckel modified his designs to accept production wings of Fieseler's Fi 103, the infamous V-1 (Vergeltungswaffe 1- Reprisal weapon 1).

All these designs provided a small well-armored cockpit in the front fuselage of the Rammrakete for the pilot. The wing area was only about 97 sq ft (9.00 sq m). Fuel tanks for the bi-fuel rocket system and the auxiliary ramjet were installed in the fuselage aft of the narrow cabin. The tail section consisted of three stabilizing fins, two of which also served as tail skids. The main skid was fitted under the forward fuselage.

The aircraft was designed to carry to air-to-air fragmentation bombs with special fuses and also to carry out "special missions" against Allied aircraft. Stöckel intended the aircraft to intentionally ram the huge tailplanes of the B-17 or B-24, thus crippling the bomber and then making off at the maximum speed of about 560 mph (900 km/h). Because of its novel propulsion system, the Rammrakete was to be launched vertically, reaching an altitude of about 42,650 ft (13,000 m), in only ninety seconds. At an altitude of 19,685 ft (6,000 m), range was expected to be more than 125 miles (200 km).

The second proposal was submitted to the Air Ministry on August 25, 1944, under the designation Raketenjäger mit zusätzlichem Lorin-Antrieb zum Ramm- oder Bombenangriff

20 Also known as impulse ducts or athodyds – aero thermodynamic ducts.



auf Bombenflugzeuge (rocket fighter with auxiliary Lorin ramjet propulsion for ramming or bombing attacks on bomber aircraft). The improved design actually differed little from its predecessor, but incorporated a modified armored jettisonable single-seat cockpit. A self-sealing fuel tank compartment was to be protected by 20 mm armor plates. The propulsion unit, similar to the first version, was mounted in the rear fuselage. In place of the triple fins, two fins with round endplates were proposed. The midget aircraft had a span of 21.65 ft (6.60 m), and a length of 22.3 ft (6.80 m). Takeoff weight was estimated at 6,600 lb (3,000 kg); of which about 3,300 lb (1,500 kg) was fuel, the armored front section weighed 440 lb (200 kg), pilot 220 lb (100 kg), a further 440 lb (200 kg) was reserved for the warload, a conventional or a modified towed bomb. The fighter was expected to reach an altitude of 32,800 ft (10,000 m) in fifty seconds, consuming about 2,425 lb (1,100 kg) of fuel. Maximum speed was believed to be 621 mph (1,000 km/h) and maximum ceiling 65,600 ft (20,000 m).

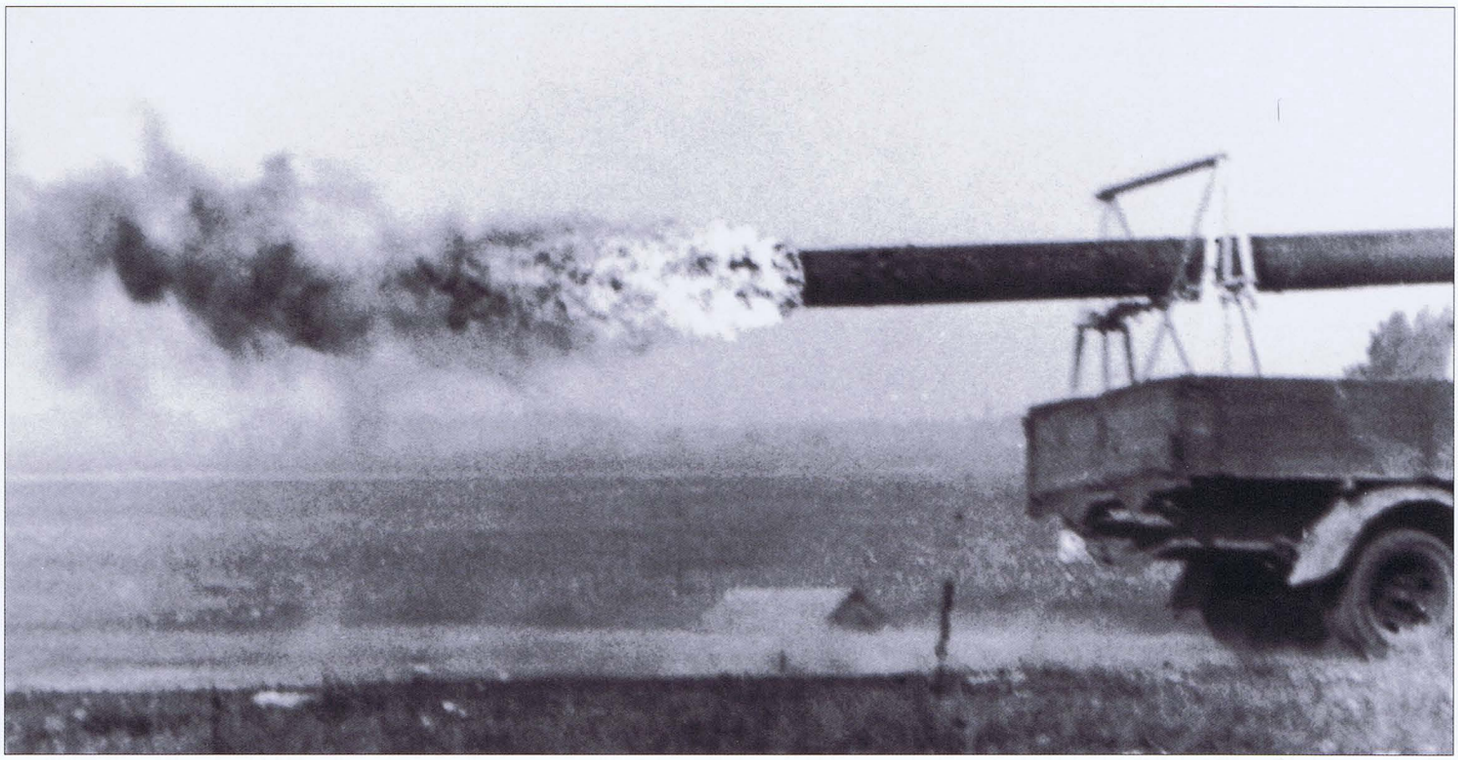
The third Stöckel proposal was referred to as Raketenflugzeug mit Luftstrahlantrieb (rocket aircraft with jet propulsion). It had an increased wingspan of 23 ft (7.00 m) and a length of about 23.6 ft (7,20 m). Instead of the rocket unit, a circular battery of small rockets was proposed. The Lorin ramjet, with a modern afterburner, was fitted behind the rockets. The performance was calculated to be similar to its predecessor, but the range was increased to at least 373 miles (600 km). Despite the promised high performance, none of Stöckel's designs were realized.

In the summer of 1941, more than three years before Stöckel entered the scene, the Messerschmitt works at Augsburg investigated a series of small fighter aircraft, namely the Me P 79/2 to /5, /7, /13b, and Me P 79/15 to /17. Several of these designs incorporated the early BMW P 3302 turbojet engine, and others were to be propelled by the Schmidt Strahlrohr (a pulse-duct designed by Dipl.-Ing. Paul Schmidt). The projected aircraft differed from oneanother in many aspects: low-, mid-, or high-wing configurations were each investigated. Various installations of the pulse-ducts, in, on, or under the rear fuselage were tested in these small single-seater fast fighters or interceptors. High climb rates and speeds were expected. Considerable time and effort were spent on the development of a multi-role defensive and offensive warplane because of their potential. One of the designs, the Messerschmitt Me P 79/Entwurf 17 was a redesigned version of Entwurf 16, a fast single-seat day fighter armed with two MG 151/20 cannon and fitted with swept-back wings. Two large skids were proposed by Messerschmitt's development department in place of a conventional wheeled undercarriage in order to control costs.

Another design in this category was the Blohm & Voss BV P 213.01-01 Miniaturjäger (miniature fighter) powered by an As 014 pulse-duct. The design, dating from November 1944, was conceived as a fighter that economized on material and manpower, and required only a minimum of general equipment.

The aircraft plan was a very small high-wing monoplane with a takeoff weight of 2,219 lb (1,280 kg), powered by a single As 014 impulse-duct adopted from the V-1 flying bomb. The mainplane was made from a single unit of wood. The fuselage was 20.3 ft (6.20 m) long and a very unusual shape, the rear portion being in the form of a boom, beneath which the As 014 was suspended. The pulsejet offered a maximum thrust of 772 lb (350 kg). The armament consisted of a single 30 mm MK 108 fitted in the P 213's nose. Only about 770 lb (350 kg) of fuel were to be carried in the aircraft's fuselage fuel tank. There were no conventional vertical tail surfaces instead, the horizontal tailplane had a pronounced anhedral. The mainwheels of the tricycle undercarriage were designed to retract into the fuselage, while the nosewheel rotated through ninety degrees before disappearing into the wheel bay of the lower nose.

At sea level, the BV P 213.01-01 Miniaturjäger had a maximum speed of 439 mph (705 km/h), and a speed of 388 mph (625 km/h) at 19,685 ft (6,000 m) was expected. Takeoff was achieved with the help of one or two solid-fuel RATO (rocket assisted takeoff) units carried under the fuselage. The Chef TLR halted further development of the BV P 213 because the performance of advanced piston-engine fighters was superior.



Above: Several tests were carried out by Eugen Sänger to determine the best method of constructing Lorin pulsejets. Here, an Opal flatbed truck is testing an experimental design in southern Germany during 1944.

Concurrently, the Heinkel company made considerable effort to realize their Heinkel P 1077 Romeo I and Romeo II projects. These two interesting rocket-propelled target-defense fighter projects were first proposed by Heinkel in August 1944. A few weeks later, on September 8, 1944, the Technische Amt of the RLM ordered production of an initial batch of twenty Nahkampfflugzeuge (short-range fighter-bombers) Julia, also referred to as Projekt Benz after its designer, W. Benz, who was initially responsible for the complete development of the aircraft. During the early development stages of this project, a twin-tail assembly was planned, since the DVL specialists as well as Flugkapitän Fiedler believed that a single fin would be unsatisfactory.

Armament of all He P 1077 variants consisted of either two MK 108s with 40 rpg, or R4M missiles carried in two jettisonable underwing containers. Alternatively, the fitting of streamlined bomb containers was suggested for the automatic air-to-air bombardment attack method referred to as März-Verfahren.

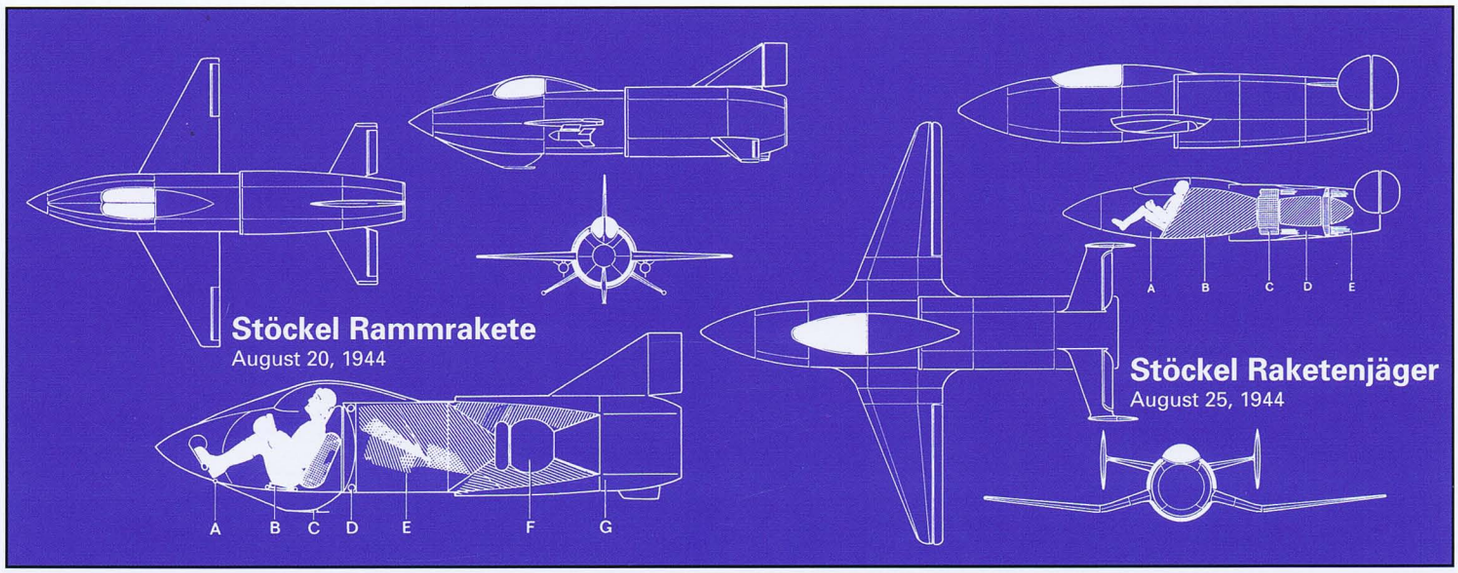
The installation of a bi-fuel propulsion system seemed too expensive and therefore, a simple pulsejet system similar to that of the proposed Junkers EF 126 was considered. However, the performance of the Romeo I fighter remained unsatisfactory due to a decrease in rated thrust, and Heinkel's team of experienced designers decided to increase the wingspan in order to reduce wing loading. This modified design, known as Romeo II, was not completed primarily because of limited production capacity. In addition, the Argus works had been heavily hit by Allied air attacks and were able to supply only a few experimental pulsejets during 1945. The two Julia variants received higher development priority because of these setbacks.

During the final months of the war in Europe, the Henschel firm also worked on the development of a pulsejet fighter aircraft. Unfortunately, only a few details have survived concerning this design, the Henschel Hs P 87 Ente (Canard). Most construction data for the Hs P 87 was seized by Soviet forces in 1945. Wind tunnel studies, which were to be carried out in late 1944, were canceled by the Chef TLR, because no research vacancy could be made available. When large portions of the Argus factory were destroyed during Allied air attacks, the ambitious Henschel project could not be carried out.

The second project, of great importance was the Junkers EF 126 Elli. The design of Elli was based on an earlier design study, the Ju EF 60, which differed in having twin fins and rudders and a pulsejet mounted close to the rear fuselage. Two variants of this project were proposed: the Ju EF 126/I (As 014) and Ju EF 126/II (As 044). The first version was conceived as a ground-attack aircraft (see Volume 2, Chapter 4), and the second model was a single-seat target defense interceptor. For takeoff, two RATO units each having 2,200 lb (1,000 kg) thrust, were to be installed, and the tricycle undercarriage would jettison once airborne. Elli resembled an enlarged piloted version of the Fi 103[21] armed with two 20 mm MG 151/20 cannon, two AB 250 bomb containers, or twelve air-to-air Panzerblitz (literally: armor lightning) rockets. After its fuel had been consumed, the interceptor would return to landed on its retractable skid. The estimated maximum speed was 484 mph (780 km/h) without an external load, and 422 mph (680 km/h) with an external load. At maximum thrust, the range would have been 186 miles (300 km) with a flight duration of only 23 minutes. At sixty percent thrust, range would have been increased to 217 miles (350 km) with an endurance of 45 minutes. Construction of a full-scale mock-up was completed, but it appears that Elli progressed no further. After the war, the Soviets reportedly considered developing the project, but it is unclear if the Russians actually authorized construction.

Heinkel evolved two proposals based on the He 162, one being an He 162 powered by an As 014 and the second by the larger As 044. Development began in early January

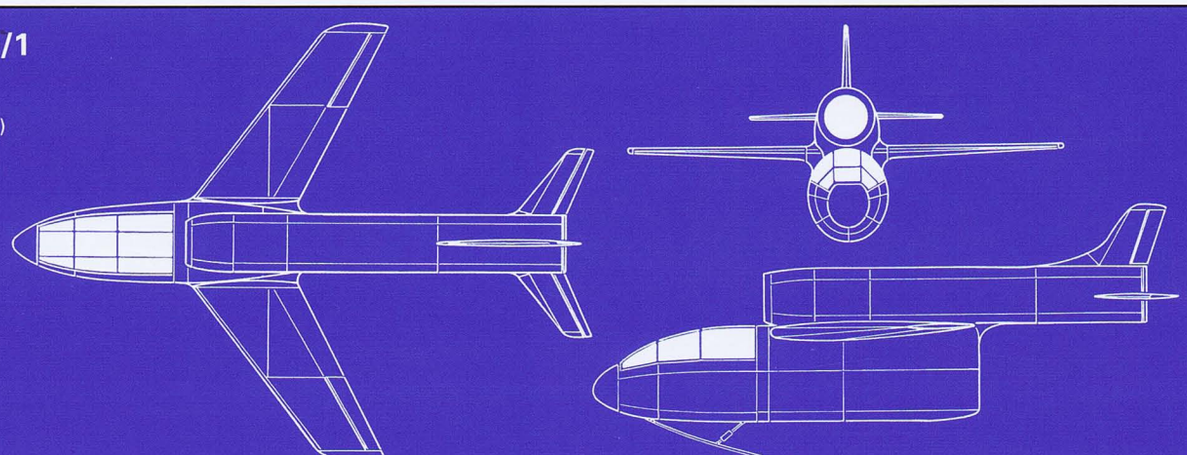
21 Piloted versions of the V-1 included the Fi 103 Re 1 (single-seat, non-powered), Fi 103 Re 2 (two-seat, non-powered), Fi 103 Re 3 (two-seat, powered) and the operational Fi 103 Re 4 (single-seat, powered).



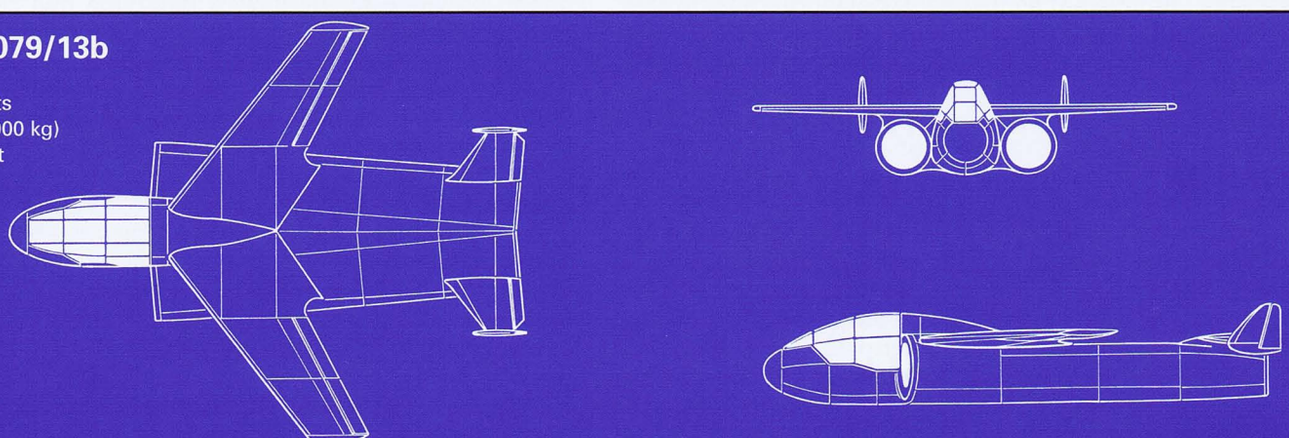
Stöckel Rammrakete
August 20, 1944

Stöckel Raketenjäger
August 25, 1944

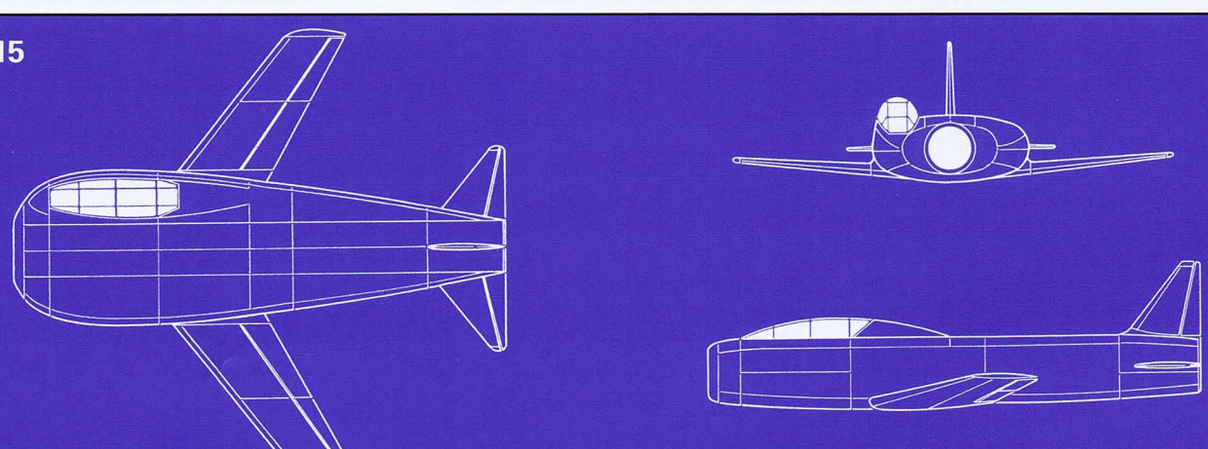
Me P 1079/1
Undated 1941
1 x Pulsejet
1,100 lb (500 kg)
static thrust



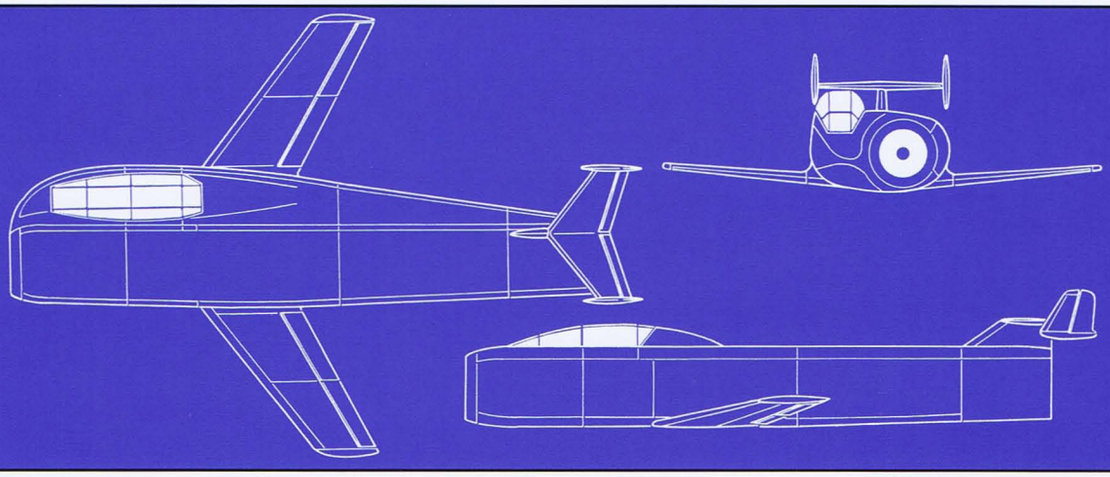
Me P 1079/13b
May 1941
2 x Pulsejets
2,200 lb (1000 kg)
static thrust



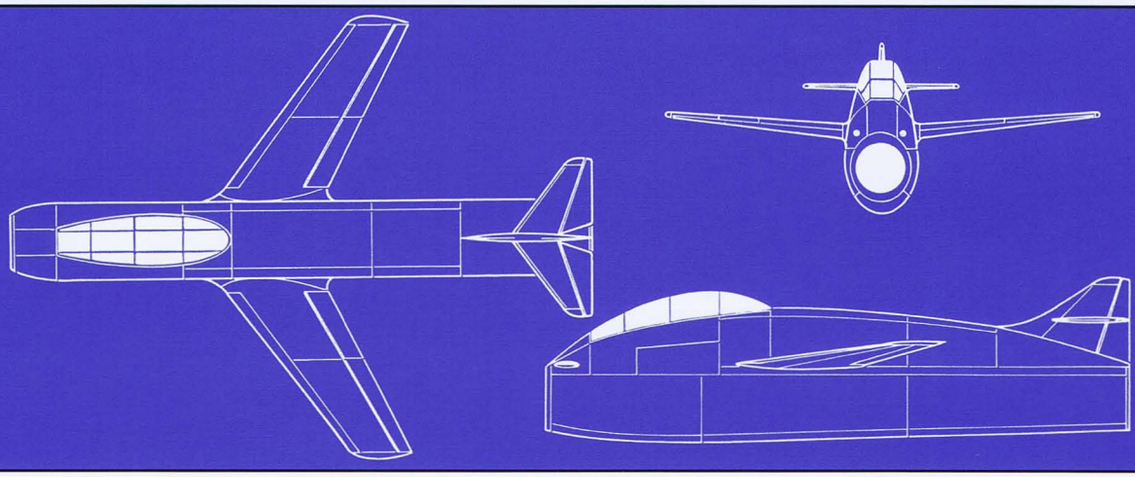
Me P 1079/15
May 1941
1 x Pulsejet

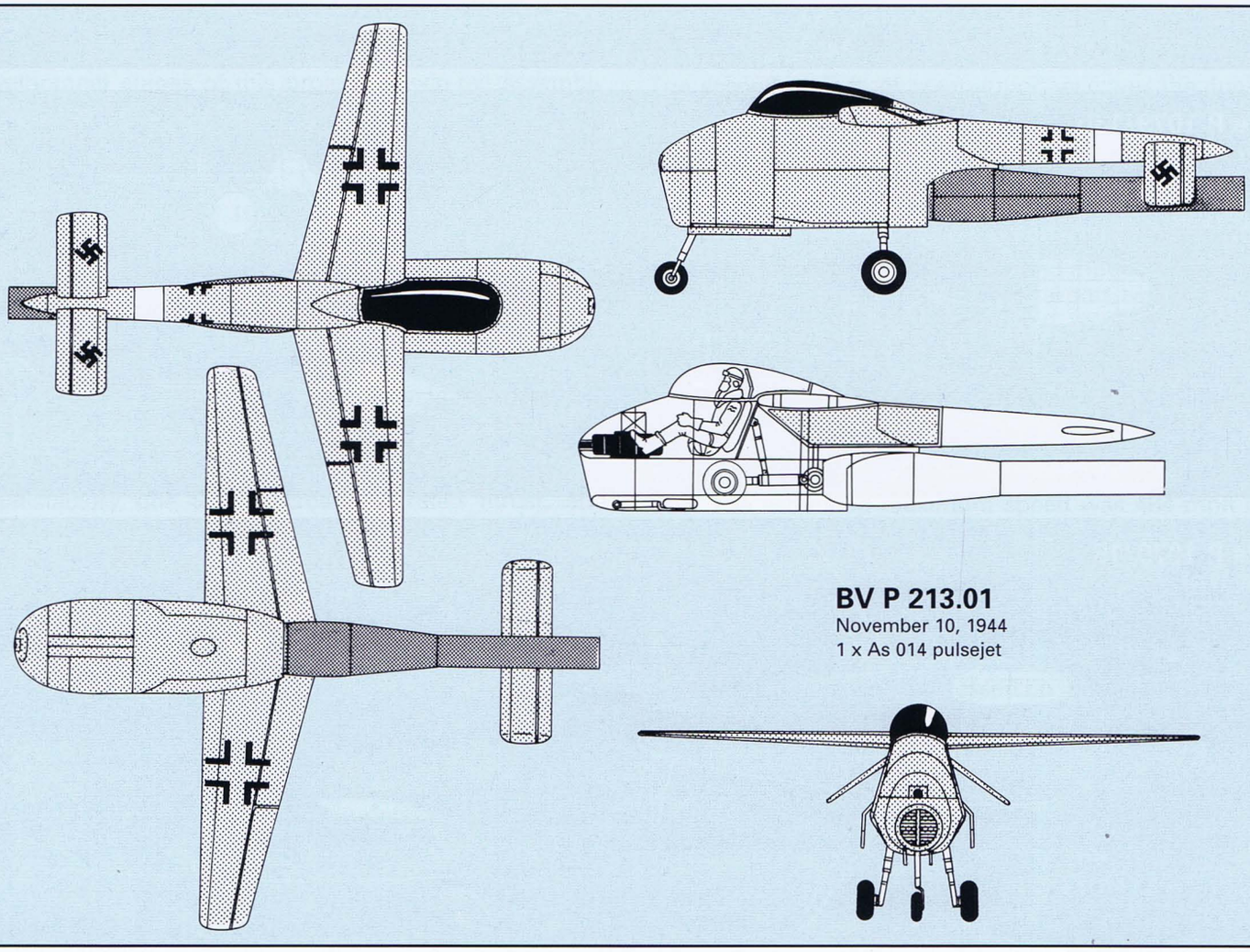


Me P 1079/16
June 1941
1 x Pulsejet

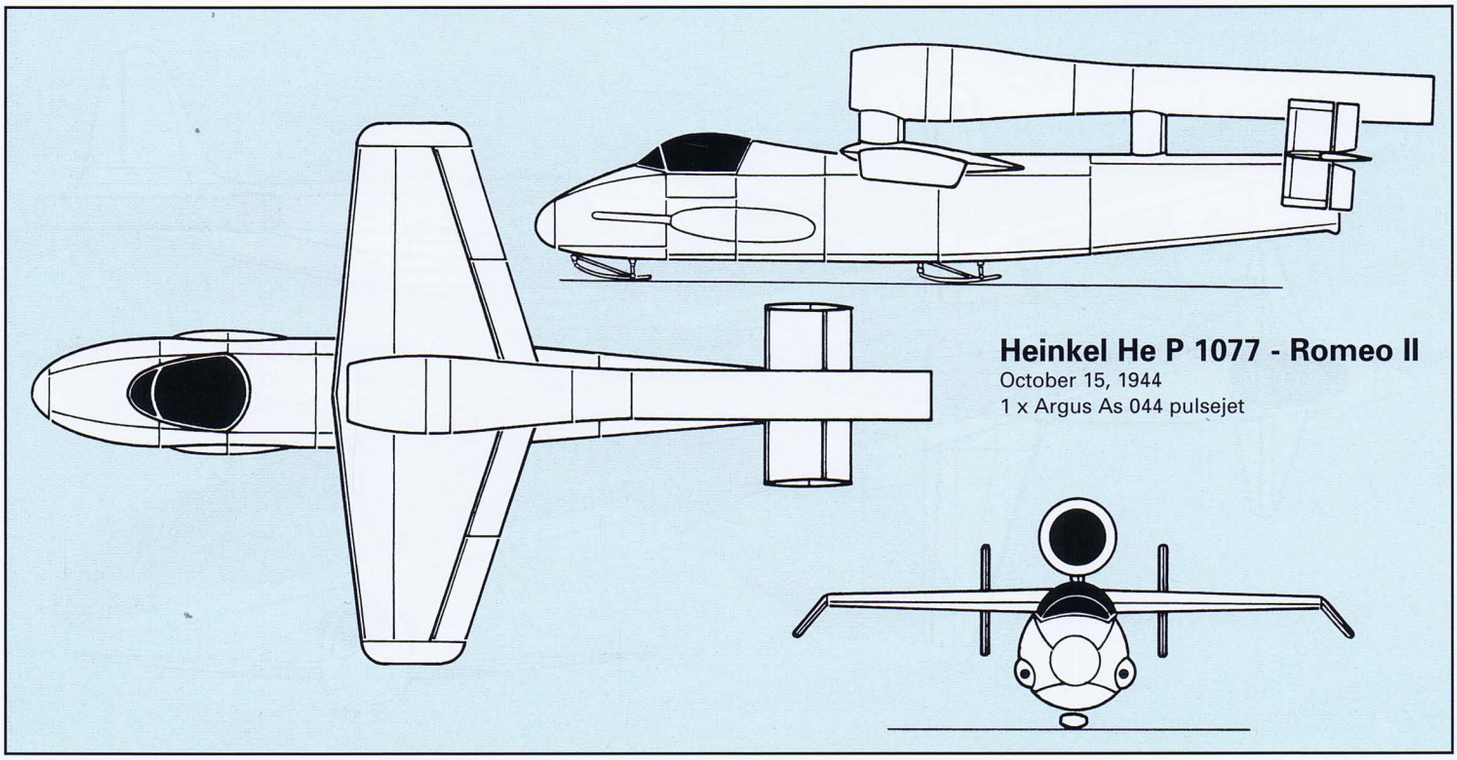


Me P 1079/51
June 1941
1 x Pulsejet





BV P 213.01
November 10, 1944
1 x As 014 pulsejet



1945, with BMW assistance, but the project was never sanctioned for series production. The idea was to create a more powerful single-seat composite (mixed) propulsion day fighter without having to created a totally new design. The final proposals were catalogued and ultimately turned over to American officers in Landsberg in July 1945.

The pulsejet-powered Volksjäger was expected to reach maximum speeds of 441 mph (710 km/h) at a combat altitude of 19,685 ft (6,000 m), and up to about 503 mph (810 km/h) at sea level. Two solid-fuel rockets, were attached under the fuselage, to create the forward velocity required for takeoff. One experimental aircraft equipped with two As 014 impulse-ducts was reportedly finished and air-launched with the assistance of a winch in late March 1945 according to Armin Kerle, a German civilian, who witnessed the event.

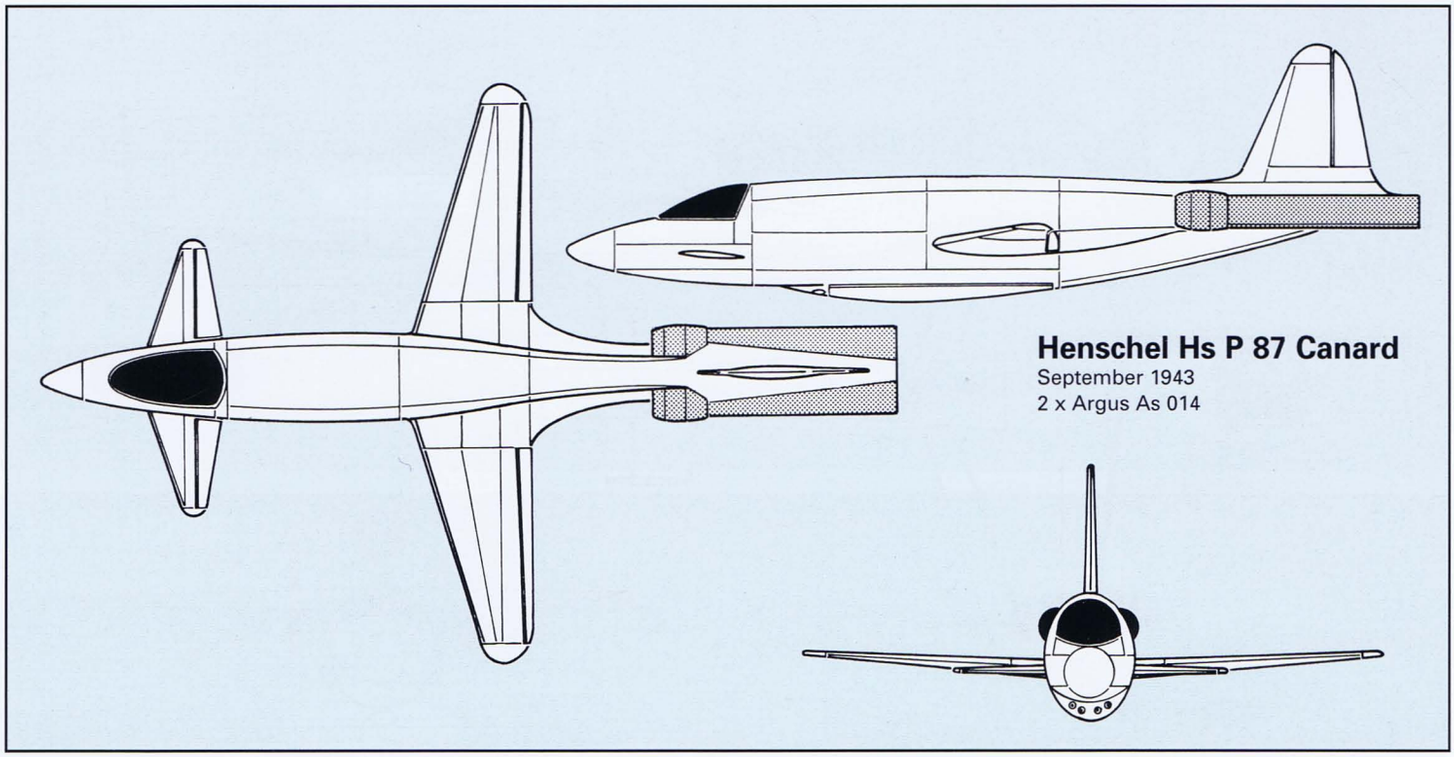
The performance of pulsejet-powered aircraft depended on flight altitude. It was therefore necessary to install larger fuel tanks, and strengthen the undercarriage, which resulted in increased takeoff weight. Theoretically, a redesigned fuselage could have allowed larger pulsejets. The war situation within Germany made construction of the modified fuselage impossible. The second experimental aircraft was most likely destroyed prior to the arrival of Allied forces, and the MK 108-armed series of the two single-seat fighter variants remained only unfulfilled projects.

Meanwhile, the Messerschmitt design bureau, code-named the Oberbayerische Forschungsanstalt, designed a highly unusual aircraft, possibly the Me P 1115, known as the Schwalbe (Swallow) that was to use two pulsejets, mounted one on top of the other, in conjunction with a wing similar to that found on the Me 163 Komet. No vertical tail surfaces were to be used, but the disposition of the two engines appeared to give the design the illusion of a vertical surface. One of the unusual features of the Schwalbe was retractable air brake incorporated into the rear tail cone. Further details of this project are unknown.

Professor Alexander Lippisch, one of the most dedicated promoters of the flying wing, also tried to create an inexpensive fighter aircraft that was designed for unproblematic mass production. Apart from his early rocket-propelled tailless designs, Lippisch also developed three advanced flying wings under the designations Li P 12, P 13, and P 13a.

The Li P 12 was an unusual tailless design with an internally positioned athodyd liquid fuel propulsion unit. The air intake was in the nose and the pilot was seated above the combustion chamber. The undercarriage consisted of a single central wheel and outrigger skids on the wing tips. The wing area was about 210 sq ft (19.5 sq.m). In August 1944, it was suggested to air-launch the aircraft using a Fw 58 Weihe (Harrier) as a carrier for the first evaluation stage, the Li P 12 being mounted piggy-back on top of the Fw 58.

In order to test the properties of the advanced flying-wing configuration, about fifteen tests of flying scale models were carried out near Vienna commencing on November 28, 1944. Previous wind tunnel tests had confirmed the soundness of the Lippisch configuration, and additional successful tests were carried out in the Spitzerberg hills near Hainburg, Austria. A few weeks later around Christmas 1944, a full-scale piloted prototype, known as the DM 1 (DM – Darmstadt München Entwurf 1, the first project and the location of its development), was under construction at Prien on Lake Chiemsee in Bavaria. Wolfgang Heinemann, a member of the Akademische Fliegergruppe (university flying group) of Darmstadt Technische Hochschule (technical high school), was responsible for the DM 1's wooden construction. For actual flight testing, the DM 1 was to be mounted on top of a Siebel 204A carrier aircraft. When Allied tanks appeared on the air field at Prien on May 3, 1945, the aircraft was nearly complete. Ninety days after the end of the war in Europe, August 6, 1945, the Americans proposed finishing the project and test-flying the prototype atop a Douglas DC-3. However, by the time the DM 1 was completed a few weeks later, the group was ordered to transfer the experimental aircraft to the United States for proper evaluation. In January 1950, the DM 1 became the property of the National Air and Space Museum (NASM) and was transferred to their storage facility outside Washington, DC.



Henschel Hs P 87 Canard
September 1943
2 x Argus As 014

The proposed DM 2 was never completed. A few drawings and calculations were finished that suggested an enlarged version of the DM 1. The third design proposal, the DM 3, had a wingspan of about 27 ft (8.25 m), a length of 29.3 ft (8.94 m), and a height of 13.5 ft (4.12 m). This single-seat experimental aircraft was designed in February 1945. It was to be powered by an HWK 509 A-2 rocket unit located in the aircraft's center of gravity. The landing gear retracted into the fuselage and the pilot lay prone in the fuselage nose. Only a few drawings of the DM 3 have survived, the originals and the general description disappeared after capture by American ground forces.

The projected Li P 13 was originally designed as a two-seater, but later appeared in modified form as the single-seat Li P 13a. The leading-edge sweepback had been increased to 60 degrees. The span was 19.7 ft (6.0 m), the wing area was approximately 215 sq ft (20 sq.m), and the aspect ratio was calculated at 1.8. The pilot was seated in the narrow leading edge of the large dorsal fin.

The solid fuel, in the form of small pellets of lignite (brown coal), was to be carried in a wire-mesh container mounted at a slight angle in the duct that was at an angle to the air stream. The airflow in the lower duct was therefore obstructed, and it was intended to start a progressive reaction with oxygen passing through the fuel. After ignition carbon monoxide was produced by the burning fuel, which combined with the oxygen in the air passing through the upper unobstructed duct section and formed carbon dioxide. This highly innovative system failed to function effectively in disappointing tests, and it was abandoned.

An improved solid-fuel design, the Li P 13b, utilized a circular basket of oval cross section suspended in the duct and rotating on its vertical axis at about 60 rpm. The combustion was started by a gas burner with liquid fuel used to facilitate starting. An alternate, more easily combustible fuel in the form of coal dust pellets was proposed, with an oxygen-carrying material spread over the outer surface of the charge.

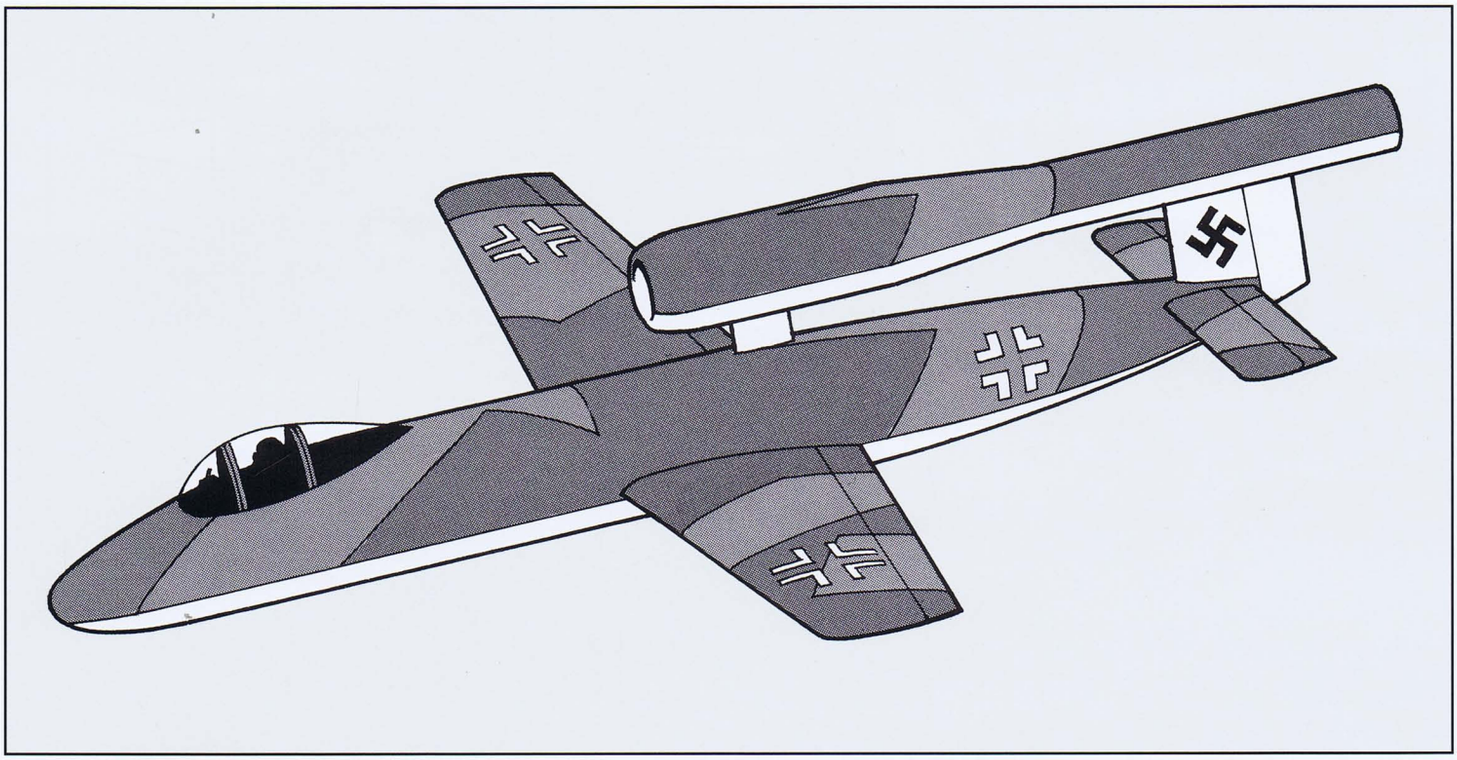
The estimated flight endurance was about forty-five minutes, burning 1,764 lb (800 kg) of coal. The all-up weight of the P 13b fighter was calculated at 5,060 lb (2,295 kg). An auxiliary rocket was to accelerate the aircraft until the optimum speed at which the athodyd ramjet would function effectively was reached.

Prior to December 20, 1944, the first series of fifteen ramjet-powered models of the P 13 were launched. Some of them flew about 500 ft (150 m) before touching down in a meadow. On December 21, 1944, the Chef TLR having been favorably impressed with the Lippisch design, ordered completion of the first experimental Li P 13 within a few weeks, with practical evaluation to begin no later than February 28, 1945. It is doubtful much was accomplished before the end of the war.

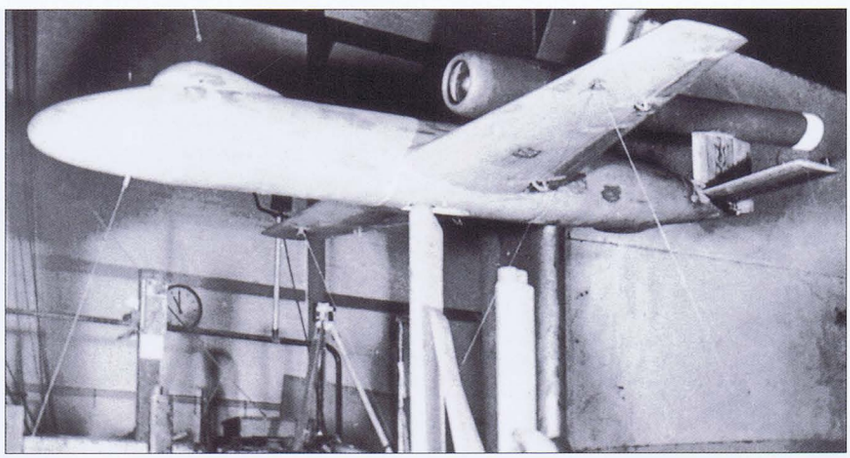
Lippisch also completed preliminary design of two additional noteworthy pulsejet aircraft. The first was the Li P 14, that had a constant chord wing with coal fuel ramjet athodyds built into the wings. The second was the Li Supersonic, a research aircraft similar to the P 13b but without a vertical tail.

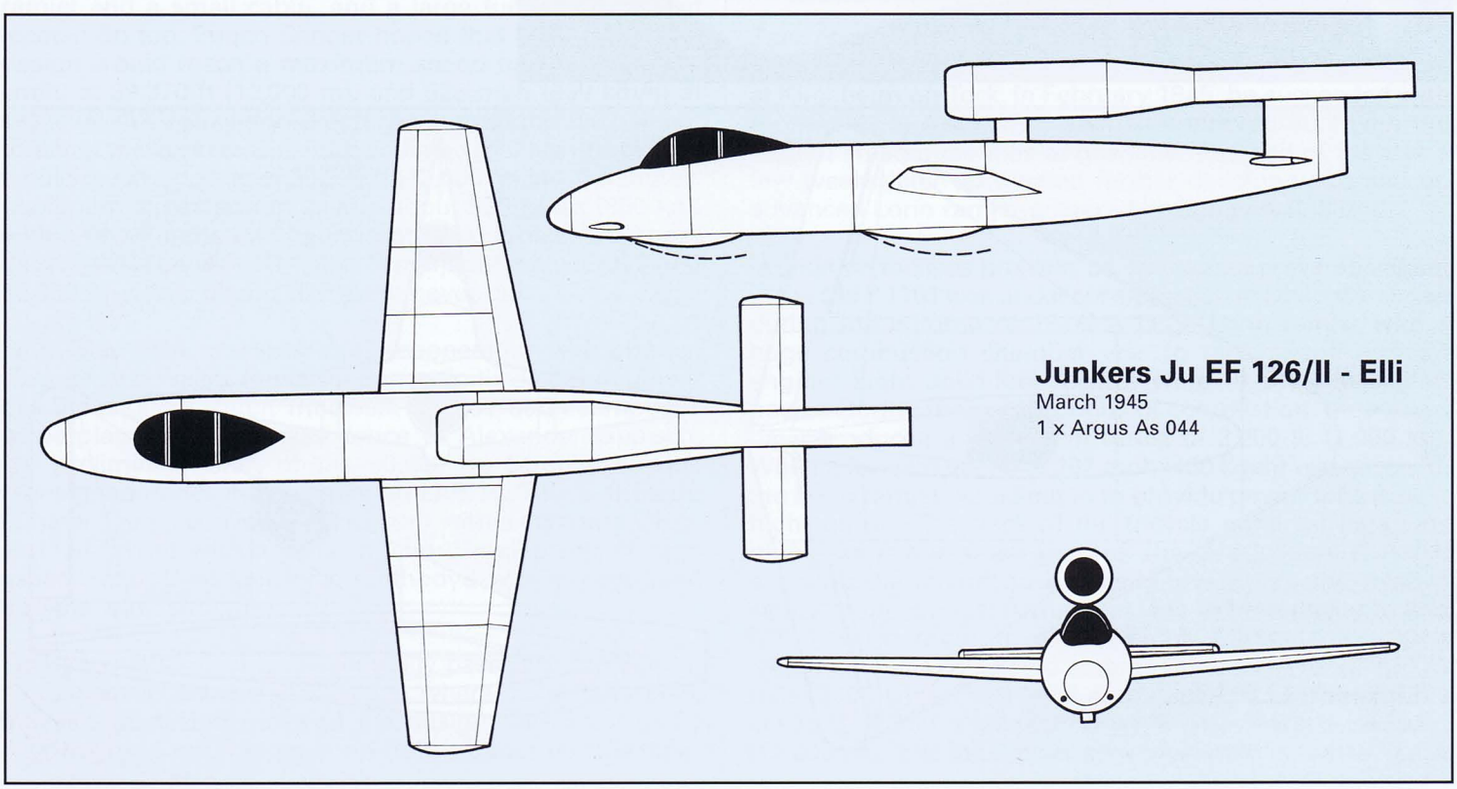
Despite further efforts, none of the flying wing designs by Lippisch were built, except for the DM 1, although many wind tunnel and other small scale models were assembled.

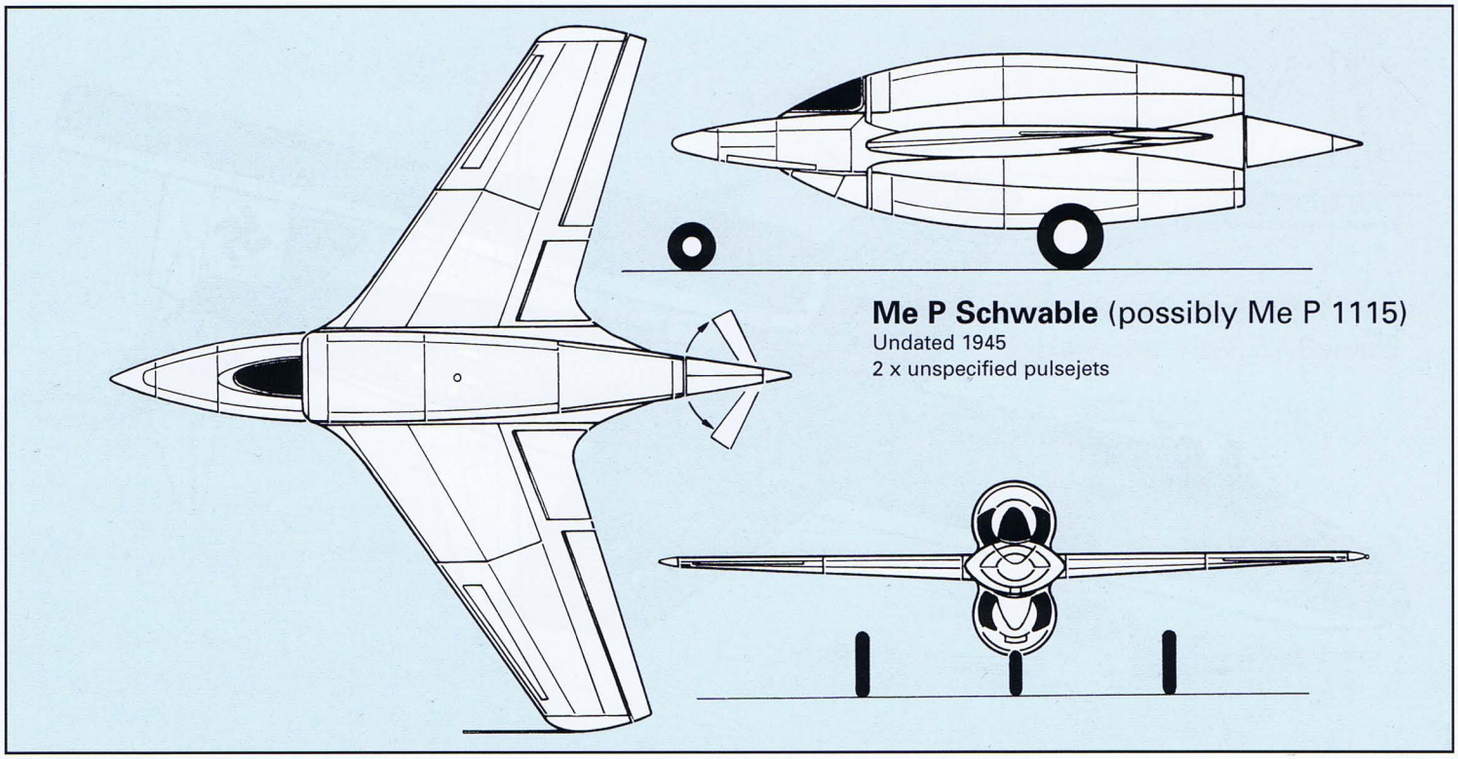
Coincidentally with Alexander Lippisch, another less well-known German scientist, Professor Dr.-Ing. Eugen A. Sänger, who had originally worked on liquid-fuel rocket combustion chambers, began investigating improved jet propulsion systems. His favorite was the Lorin ramjet created by René Lorin in 1913. After testing numerous small scale models, in the autumn of 1941, Dr. Sänger sought to prove the concept by fitting a full-size Lorin ramjet unit on an Opel Blitz truck. Further tests were carried out with the ramjet mounted on a twin-engined Dornier Do 17 Z-2, and later on a larger Do 217 E-2, RE+CD, despite the fact the RLM's apparent disinterest. Since high-grade aviation fuel was in relatively short supply, every possible use of low-grade fuels had to be investigated. However, on November 30, 1944, RLM officials finally came to accept



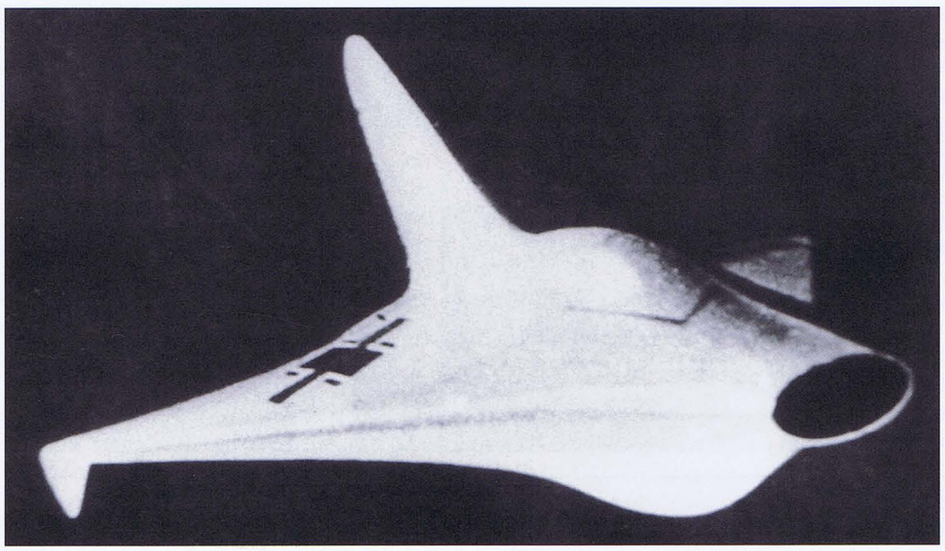
This page: The Ju EF 126/II "Elli" was designed as a simple single-seat target defense interceptor powered by an Argus As 044 pulsejet. It was essentially a slightly enlarged version of the Ju EF 126/I close-support project. For takeoff, it was to use two RATO units mounted beneath the wings while the tricycle undercarriage would be jettisoned. Landing would be accomplished by two small retractable skids located beneath the fuselage. The pilot of "Elli" would have had a variety of weapons including two 20 mm cannon plus air-to-air rockets. The photograph, shown right, shows a wooden mockup undergoing testing in a wind tunnel.



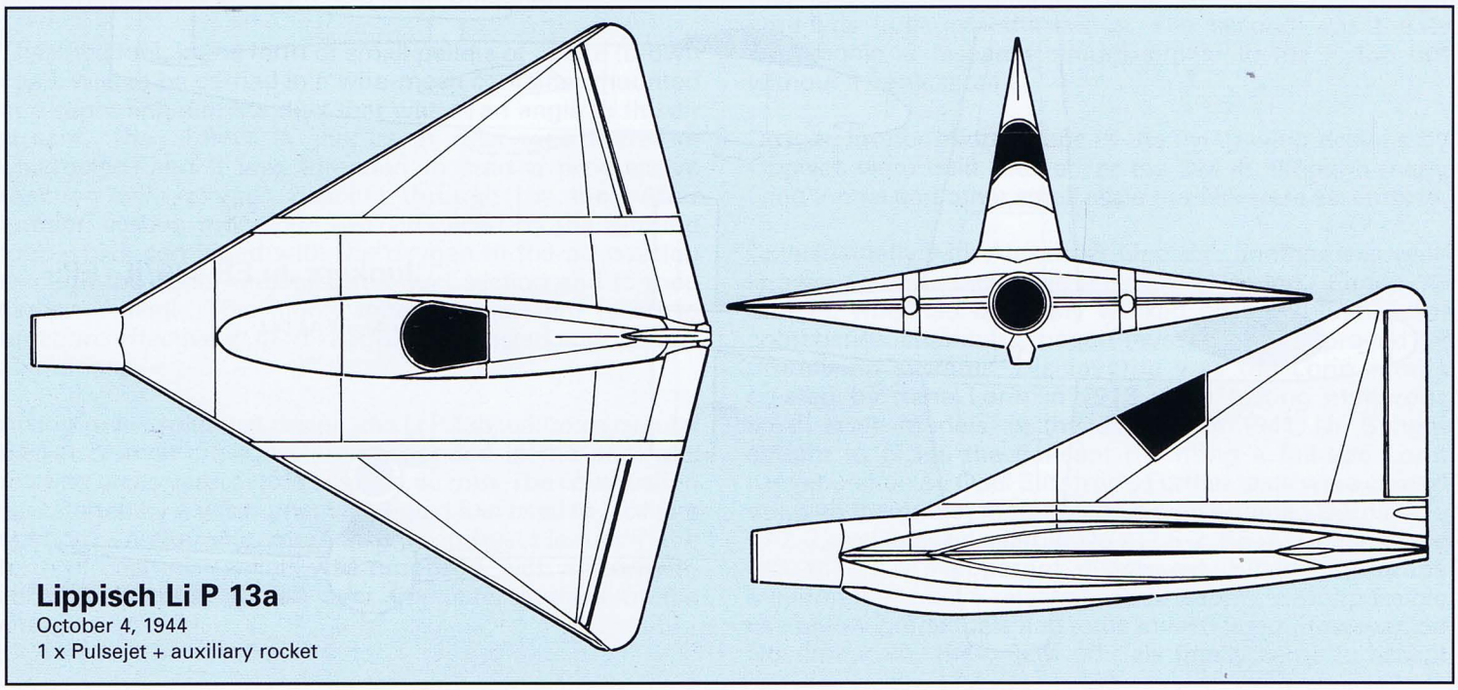




Me P Schwable (possibly Me P 1115)
Undated 1945
2 x unspecified pulsejets



Left: A wartime scale model of Alexander Lippisch's Li P 12 ramjet fighter project of 1943. It was essentially a single-seat delta wing tailless aircraft to be powered by a liquid fuel ramjet (athodyd). Because the ramjet could only be started once the aircraft was in forward motion, it was planned to air-launch the fighter from the back of a larger carrier aircraft. Landing would be accomplished with the aid of a large central wheel plus wing tip skids.



Lippisch Li P 13a
October 4, 1944
1 x Pulsejet + auxiliary rocket

Above: Lippisch's DM 1 was actually a full-scale flying prototype for his Li P 13a delta wing tailless fighter project of 1944. At the time of its capture, the DM 1 was still incomplete. Under American supervision the German team was allowed to finish the unpowered aircraft prior to its being brought to the United States for extensive testing. The aircraft survives and is currently in storage for the National Air and Space Museum.

the importance of ramjet development and its usefulness in military applications. Thus encouraged, Sänger and his future wife, Dr.rer.nat.Irene R. Bredt, designed the Strahljäger mit 60,000 PS Triebwerk (jet fighter with 60,000 hp engine) that had a takeoff weight of 15,430 lb (7,000 kg).

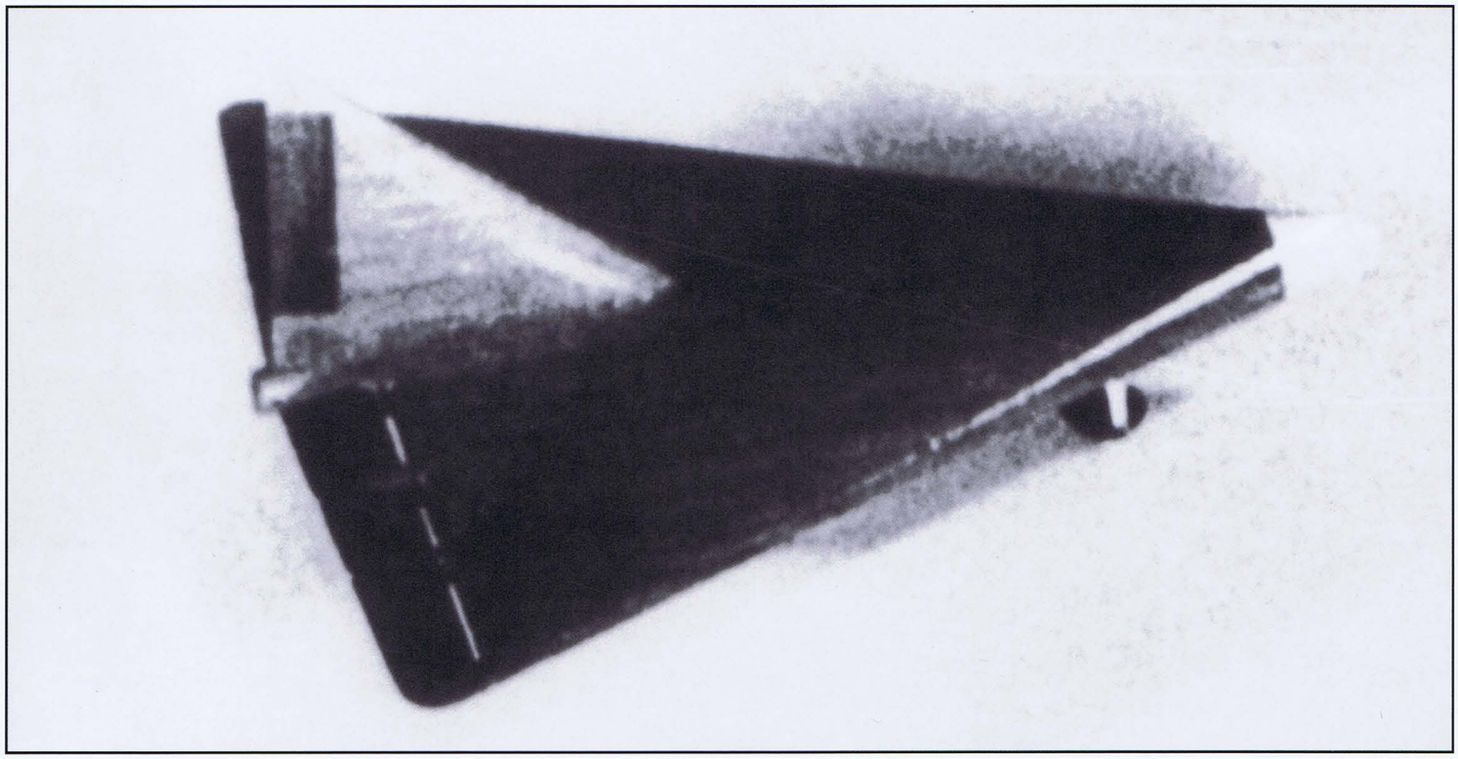
The single-seat fighter had a length of 34.1 ft (10.40 m) and a wingspan of 39.4 ft (12.00 m). It consisted of a huge Lorin ramjet and a small cabin, and a large fuel compartment located on top. Eugen Sänger hoped that this high-speed design would reach a maximum speed of 466 mph (750 km/h) at 39,370 ft (12,000 m), and 528 mph (850 km/h) at sea level. With auxiliary takeoff rockets and the 100 percent thrust of the Lorin ramjet, he calculated that his Strahljäger would reach a ceiling of 39,370 ft (12,000 m) in 2.5 minutes. Maximum expected range was about 528 miles (850 km) with a fifty-minute endurance. Later on, Professor Sänger developed a series of smaller Strahljäger with 20,000 and 40,000 hp powerplants, that were never built.

From May 1944, onwards, and in cooperation with Dornier, Junkers, and Walter, Professor Sänger initiated development of a Staustrahl-Raketen-Triebwerk (ramjet/rocket composite powerplant). With the assistance of Alexander Lippisch, the preliminary draft of the 60,000 hp Strahljäger was redesigned under the designation Li P 14. This is thought to have been a conventional aircraft with a standard wing-and-tail layout with a constant-chord mainplane of high aspect ratio. Coal fuel for the athodyd was incorporated into the wing structure.

This unusual project was eventually passed to the Skoda-Kauba firm at Cakowitz near Prague, where, in February 1945, the aircraft design received the designation SK P 14-01 Jagdflugzeug mit Sänger-Lorin-Rohr (fighter with Sänger-Lorin ramjet). The single-seat fighter was fitted with a central Lorin ramjet, and armed with a single MK 103 cannon in the fuselage above the prone pilot. A large fuel tank of 172 US gallons (540 liters) and a second tank of 40 US gallons (150 liters) capacity were installed in the fuselage boom carrying the dorsal fin. Two additional 53 US gallon (200 liters) tanks were carried in the wings. The wing span was 23 ft (7.00 m) and fuselage length measured 32.3 ft (9.85 m). An air speed of 621 mph (1,000 km/h) at sea level, a cruising speed 398 mph (600 km/h) at 42,650 ft (13,000 m) was expected; an absolute ceiling of 60,700 ft (18,500 m) was considered possible. A slightly modified and more powerful version, the SK P 14-02, would have become airborne with the aid of RATO and a jettisonable tricycle dolly. Landing was to be accompolished by a central retractable skid.

Basic research into coal dust fuel, alternatives, for the Lorin ramjets was created by Dr. K. Wahl of the technical laboratory at Kirchheim on Teck. In February 1945, he succeeded with a one-minute test run of a small improved duct with the help of small quantities of gasoline. The end of the war a few weeks later terminated further development, and no advanced Lorin ramjet-powered design was finalized.

In addition to these projects, a Lorin ramjet-powered variant of the Me P 1101 was under consideration in Oberammergau during the autumn of 1944. A large Lorin ramjet with a huge combustion chamber was to replace the turbojet engine. Eight solid-fuel rockets were to provide takeoff power. During their six seconds of combustion, they could have produced a maximum thrust of 2,200 lb (1,000 kp). When a forward speed of 267 mph (430 km/h) was reached, the Lorin ramjet would cut in to provide power for the next flight phase. The track of the tricycle undercarriage was much narrower than that of the production P 1101, enabling the aircraft to be easily towed into the relative safety of the woods. Armament was to be reduced to two MK 108s in order to save weight. Climb to 32,800 ft (10,000 m) was calculated at three minutes. A range of 248 miles (400 km) at sea level and a speed of 510 mph (820 km/h) at 32,800 ft (10,000 m) were projected. At 39,370 ft (12,000 m), the maximum speed was expected to reach



621 mph (1,000 km/h). Compared to other Lorin ramjet fighters, the Me P 1101L had a superior endurance of fifty minutes.

Another ramjet-powered aircraft was the Focke-Wulf P 188 Strahlrohr-Jäger (pulsejet fighter), which received the Air Ministry's GL/C number 8-283. This single-seat fighter was first proposed in June 1944 and the project was officially identified as the Ta 283. The fighter had an exceptionally long and rakish fuselage and sharply swept-back wings spanning 26.3 ft (8.00 m) set low on the fuselage. The takeoff weight was estimated to be 11,905 lb (5,400 kg). Leading and trailing edges of the tailplane, which carried the two ramjet propulsion units at its tips, were also swept-back.

The cockpit was positioned midwing in the 38.9 ft (11.85 m)- long fuselage, the canopy blending smoothly into the large dorsal fin. A Walter bi-fuel HWK 509 A-1 rocket unit was mounted in the rear fuselage. The planned armament consisted of two MK 103s with 60 rpg fitted in the nose. A 20 mm armor bulkhead aft of the guns protected the front ramjet fuel tank of 370 US gal (1,400 ltr) contents. Aft of the cockpit, three additional fuel tanks were installed, two of which were used for the S- and T-Stoff fuels for the HWK 509. The Walter takeoff rocket produced a thrust of about 7,275 lb (3,300 kg). For takeoff and acceleration, the rocket was to be operated for thirty-three seconds. This left sufficient fuel for further speed bursts should it become necessary to fly another circuit after a missed landing approach. Focke-Wulf's calculations gave maximum speeds of 684 mph (1,100 km/h) at sea level, and 593 mph (955 km/h) at 35,600 ft (11,000 m). At this higher altitude, a range of 435 miles (700 km) and an endurance of forty-three minutes were expected.

The RLM eventually canceled the project during the Autumn of 1944 because development of the Ta 283 would be too protracted to warrant continued work.

Another athodyd-propelled fighter, the He P 1080.01, was one of Heinkel's last projects, the details of which were drafted early in 1945. This Heinkel project was a single-seat fighter with an athodyd unit in each wing root. The span of

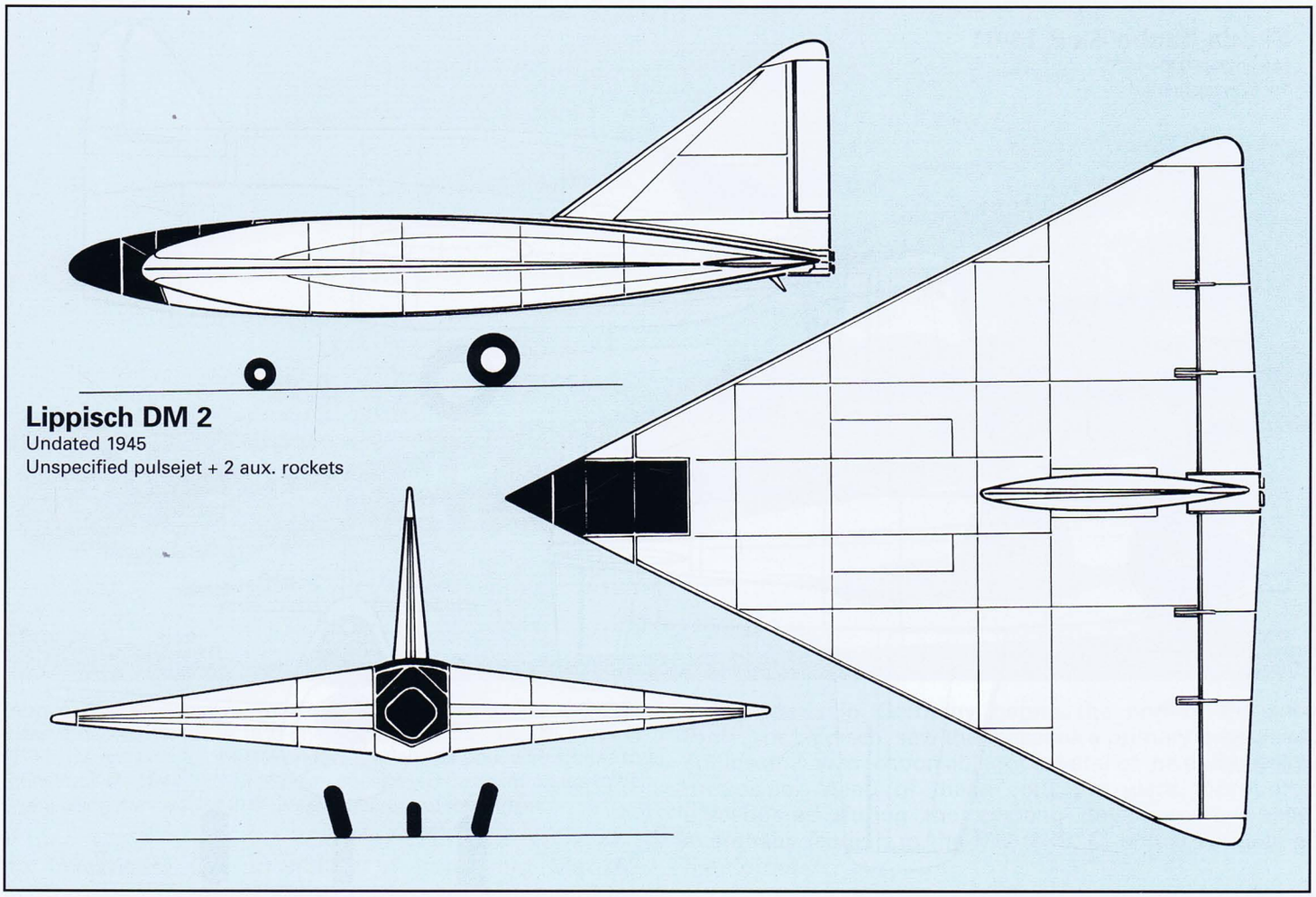
Above: A wind tunnel model of the DM 2 project designed early in 1945. This delta wing tailless fighter featured a prone pilot in the aircraft's nose and was to have served as a flying prototype for Lippisch's Li P 14. Although few drawings or other data have survived, the project was essentially an enlarged DM 1.

the sharply swept-back wing was 29.2 ft (8900 mm), and the wing area was about 218 sq ft (20.00 sq m). There was a single fin and rudder, but no horizontal tailplane. According to surviving drawings, the athodyd ramjet units appeared to be of the Sänger type with an overall length of 26.75 ft (8150 mm), and the diameter of the combustion chamber was 4.9 ft (1.50 m). Takeoff acceleration of the Lorin ramjet-powered fighter was provided by four RATO units, each developing 2,200 lb (1,000 kg) thrust. Two rockets were mounted on the takeoff trolley, the others under the fighter's wings. When the first pair completed their burn during the takeoff-run, the second set ignited for liftoff, and then the Lorin ramjets would be started on reaching the forward velocity needed for combustion. Heinkel believed the fighter would be ideally suited for stratospheric flight, but these advanced Lorin ramjets were not sufficiently tested before the end of hostilities.

The He P 1080's cockpit was well forward in the nose, in front of a single large fuselage tank. The armament was to comprise only two MK 108s mounted low on each side of the cockpit. The aircraft would land on a retractable centrally mounted skid.

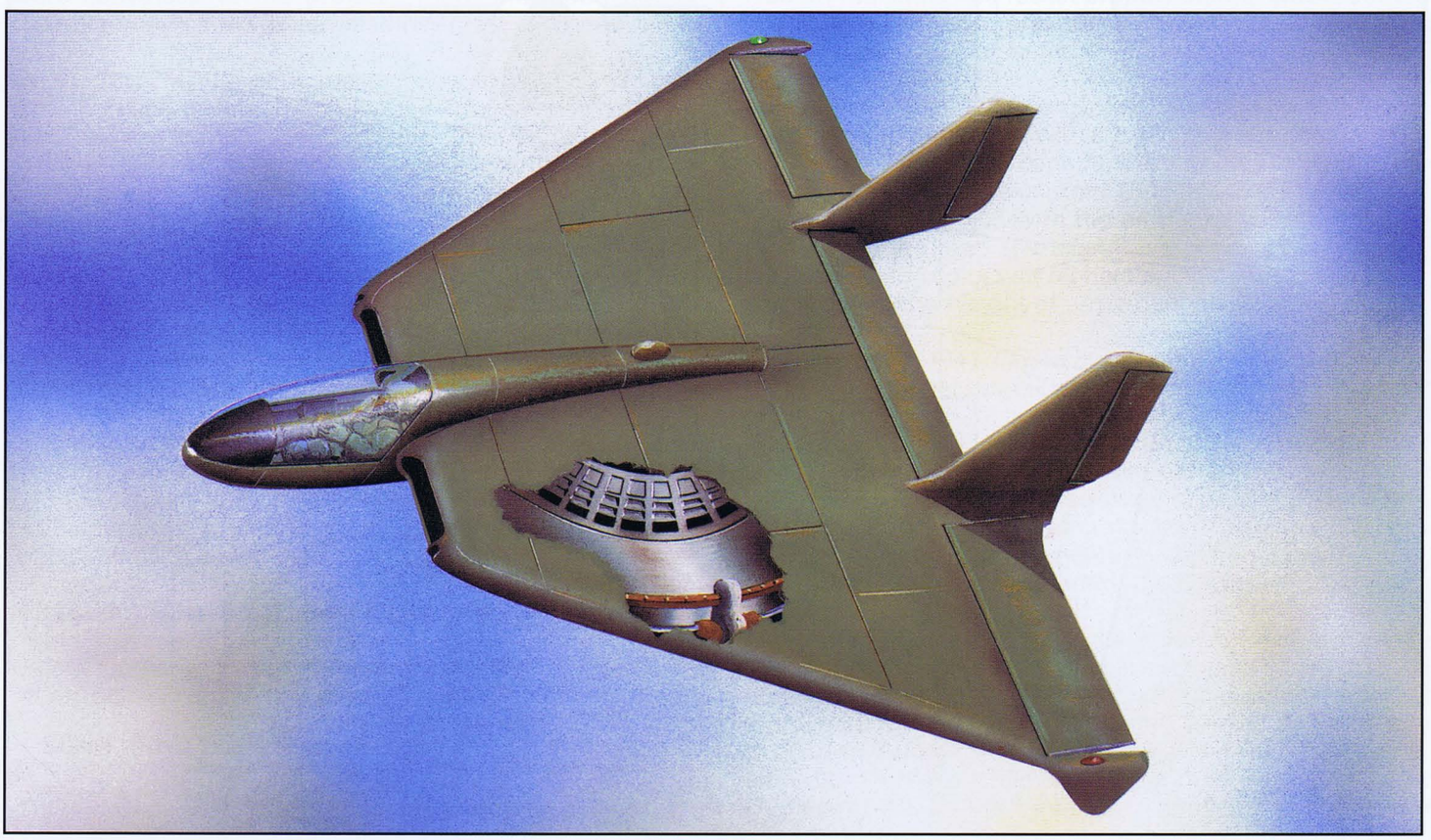
Only two additional composite propulsion (pulsejet with turbojet) fighter designs were investigated. One of these was the Fw Jäger mit 2 Lorin-Triebwerken und 1 TL (fighter with two Lorin ramjets and one turbojet). Mentioned briefly in an isolated report, it would have been a more complex variation of the Ta 283 project.

The second design with composite propulsion was advanced by Eugen Sänger and two DFS specialists under the designation Me 262 A-1 mit Lorin-Zusatzantrieb (with additional Lorin propulsion). Late in 1944, the Oberbayerische Forschungsanstalt directed the DFS's establishment at Ainring, near Bad Reichenhall in Bavaria,

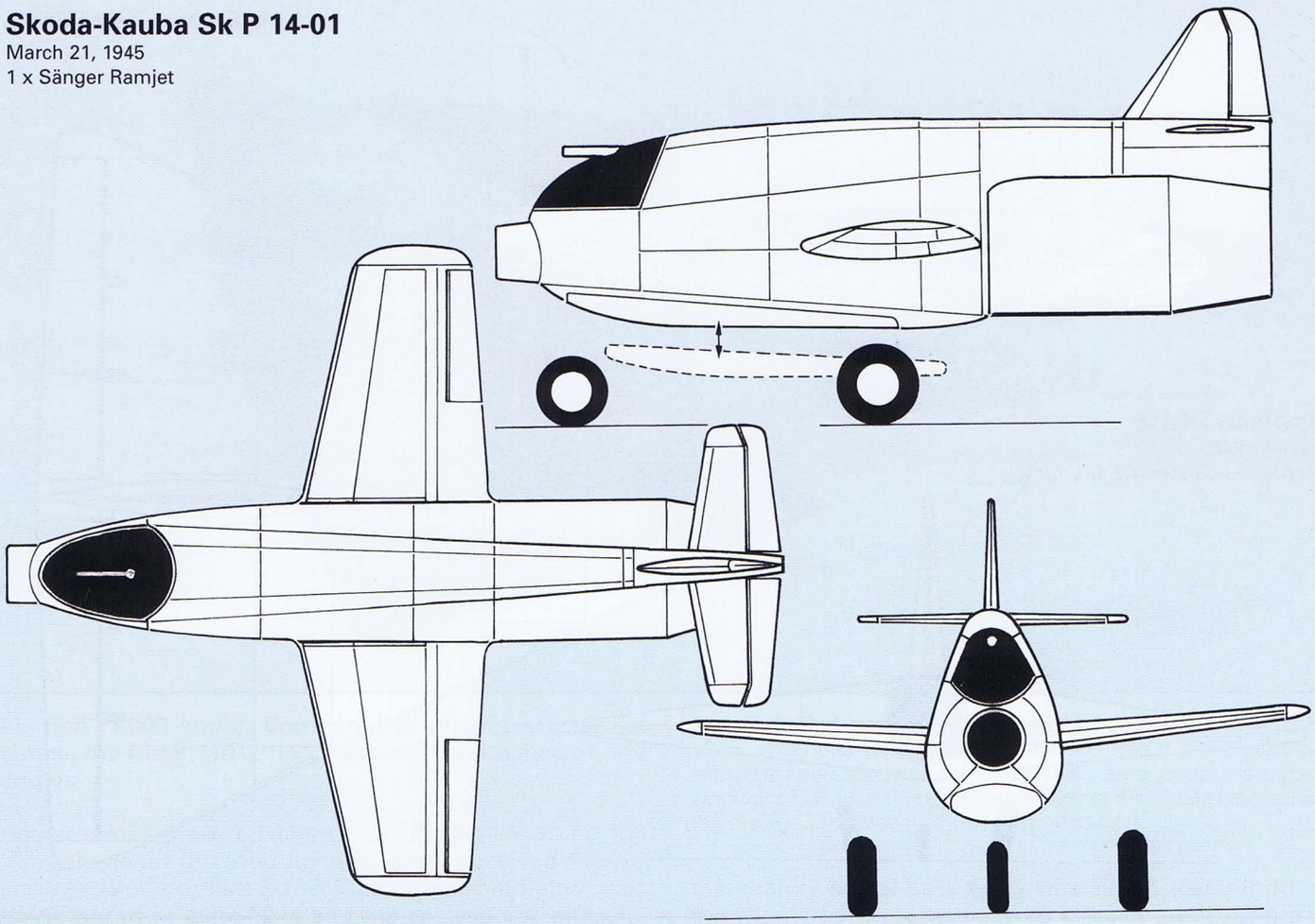


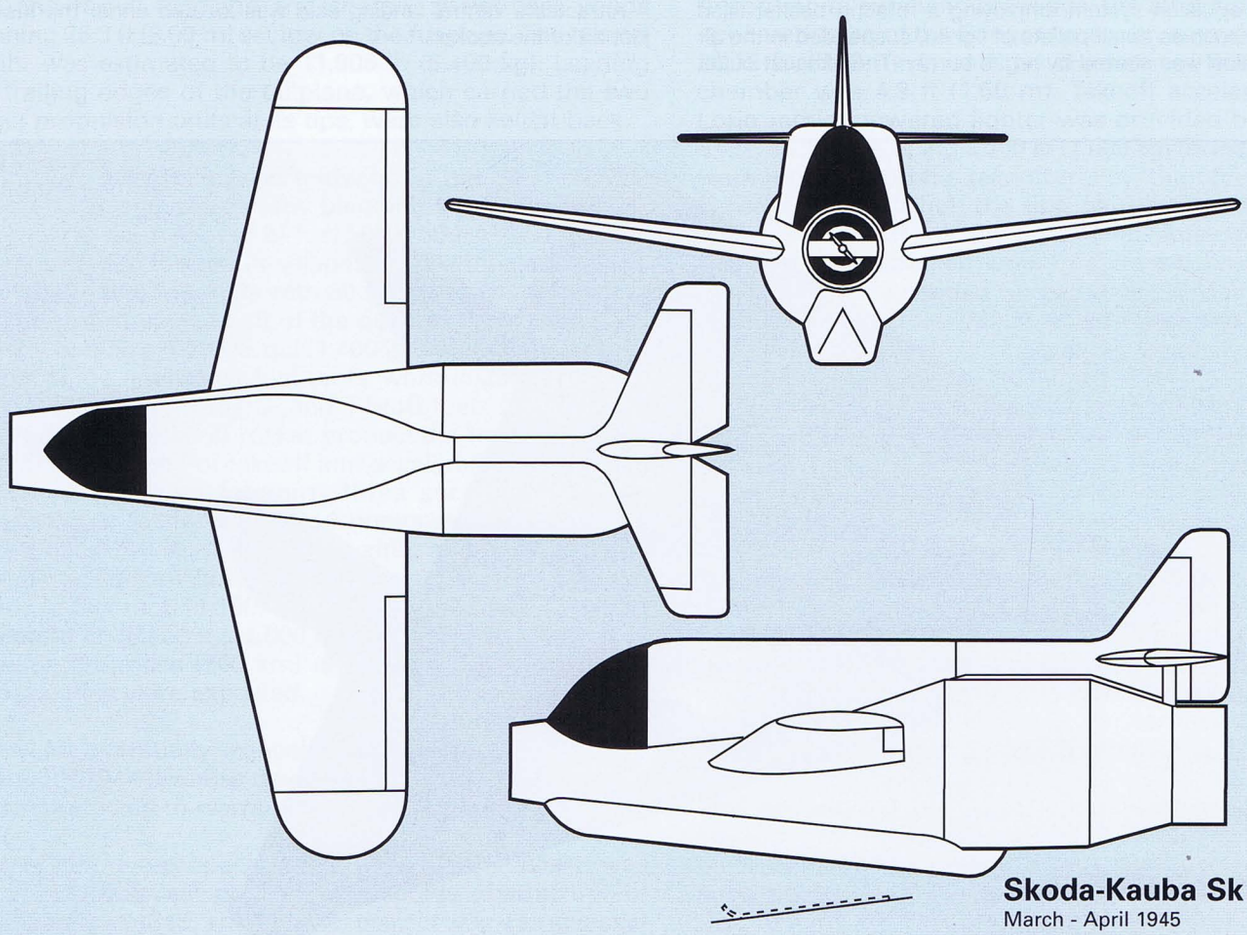
Lippisch DM 2
Undated 1945
Unspecified pulsejet + 2 aux. rockets

Below: Aviation artist Bob Boyd's rendering of the Li P 13b shows the unusual propulsion system employing a rotating basket filled with solid fuel, such as small pellets of lignite, suspended in the air duct. Combustion was started by a gas burner. The exhaust outlet occupied the entire trailing edge between the two vertical tailplanes. A retractable ventral landing skid was located under the fuselage just aft of the cockpit.

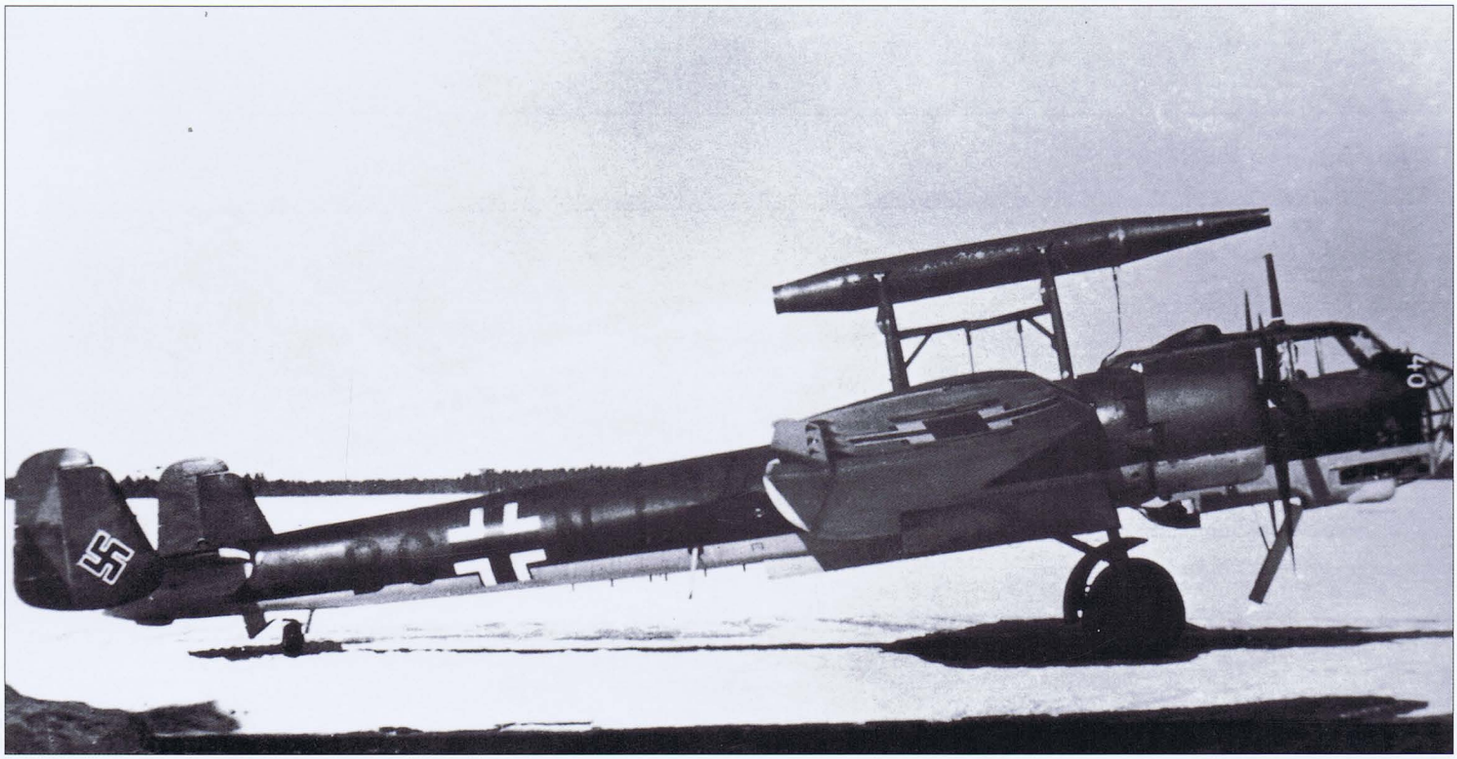


Skoda-Kauba Sk P 14-01
March 21, 1945
1 x Sänger Ramjet





Skoda-Kauba Sk P 14-02
March - April 1945
1 x Sänger Ramjet



Above: One of several ramjets tested by Eugen A. Sänger is shown here mounted above a twin-engined Do 17 Z-2, BC+NL, during 1942. Ramjets could operate on low-grade fuels and were simple to construct. By 1944, the Air Ministry considered these attributes to be compelling reasons for further development of the ramjet.

to investigate the possibility of improving Me 262 performance by installing two Lorin ramjets on top of the conventional jet engines. A much better rate of climb as well as an improved service ceiling were expected from the extra power provided by the ramjets. Despite the fact that conversion to fit the two Lorin ramjets was considered to be very expensive, Dipl.-Ings. W. Peterson and W. Lungstras were convinced of the project's merit and soon hoped shortly to have a Me 262 available for test purposes.

On the Me 262, the only practical way to fit the two Lorin ramjets, each weighing 551 lb (250 kg), was by installing them on top of the Jumo turbojets over the wings. Two 1,100 lb (500 kg) thrust RATO units were to be used to accelerate the fighter to takeoff speed. With both engines at maximum power, the aircraft needed a takeoff run of about 3,500 ft (1,065 m). The DFS team estimated that the climbing time to 32,800 ft (10,000 m) was only six minutes, and the absolute ceiling was an expected 49,200 ft (15,000 m). Further calculations made in early February 1945, confirmed a possible maximum speed of 542 mph (873 km/h) at an altitude of 25,250 ft (8,000 m).

Further development was halted a few weeks later because the Lorin ramjets were not available in sufficient quantity, and the aircraft equipped with composite engines would probably perform below the OKL's combat performance expectations.

Rocket-Propelled Single-Seat Fighter Aircraft

Except for the well-known Messerschmitt Me 163 Komet, no other rocket-propelled single-seat fighter[22] reached operational status in Germany before the end of the war. Professor Lippisch, saw the rocket as a primary propulsion engine and, was responsible for several of the early design proposals. Many of these concepts were thoroughly investigated during the ensuing development phase, eventually leading to the Me 163B, C, and D variants of the Komet.

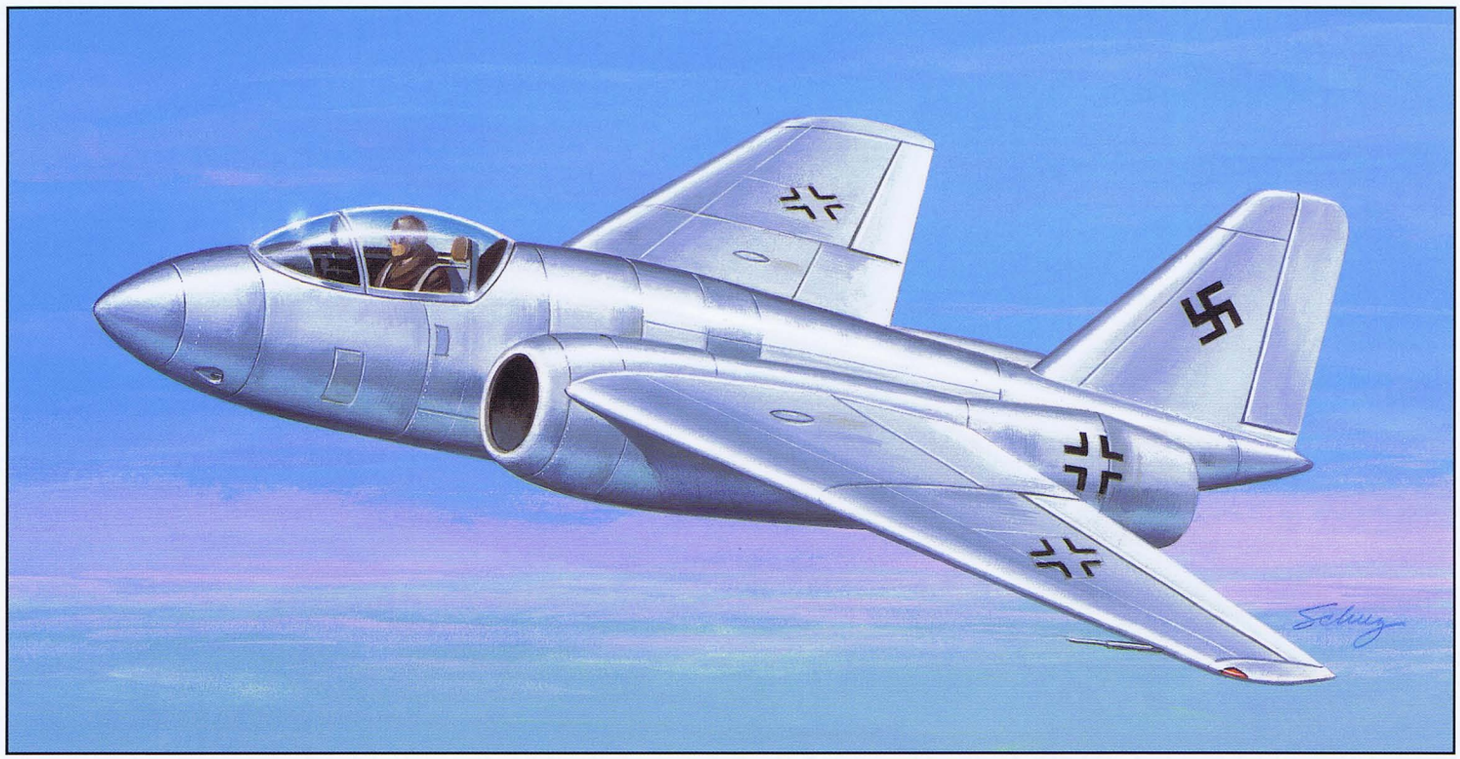
Among the very early attempts to develop a rocket-powered fighter was the Lippisch Li P 01-114 an extremely small aircraft of only 21.3 ft (6.50 m) in length. A general design drawing, completed on July 19, 1940, revealed an aircraft with a narrow fuselage incorporating a large 1,945 US gal (735 ltr) fuel tank. The rocket propulsion unit was mounted in the rear fuselage, and the combustion chamber was located under the dorsal fin.

The larger Li P 01-117 interceptor, developed in July 1941, had a pressurized cockpit with the pilot in the prone position. Four to six MG 151/20 cannon were to be installed in the front fuselage, near the cockpit. The fuel tanks were located in the fuselage center, with the bi-fuel rocket motor being mounted in the rear. The takeoff weight and wing load of the project interceptor was higher than that of its predecessor partly due to the weight of armament and ammunition.

Early in August 1941, Lippisch presented two further rocket-propelled fighters, the Li P 01-118 and 119. The armament of the first consisted of two MG 151/20 cannon firing forward, while the second carried four weapons. A large fuel compartment was positioned within the fuselage, and the proposed rocket motor had two separate combustion chambers to increase the aircraft's combat range. The two designs, though complementary, differed considerably, especially in the arrangement of the cockpit.

The Li P 05, a conversion of the P 01-119, had a fuselage that stretched to 25 ft (7.60 m), permitting an increase in the total fuel capacity. Lippisch had planned to use a rocket motor with three combustion chambers, two of which were to be used during takeoff and climb to the aircraft's combat altitude. The wingspan was also increased to 39.4 ft (12.00 m). Air brakes were fitted under the wings. The

22 The term fighter in this instance is something of a misnomer. The combat mission of rocket-powered "fighters" was purely that of an interceptor. Because of its extremely limited range and fuel supply, it would not have succeeded as a true fighter.



armament and the general equipment were similar to its precursor, with the exception of a number of minor modifications to the radio installation. The design was finalized in late August 1941, but was eventually dropped primarily because of its elaborate propulsion system.

Development of the well-known Me 163 interceptor began with the top-secret Projekt X, which evolved into what was to become the Me 163A. Professor Dr.-Ing. Alexander Lippisch, head of Abteilung L (Department L) located in a section of Messerschmitt's Augsburg plant, decided to use the rocket-powered DFS 193 in order to obtain reliable test data that he could more accurately refine his design. In August 1940, the DFS 193 was successfully test-flown by the famous test pilot Heini Dittmar. The result of this and other flights was that the Reichsforschungsführung (Reich Research Planning) recommended active development of the Me 163.

The first experimental test prototype of the Komet, the Me 163 V4, KE+SW, commenced flight testing on February 13, 1941, when it was towed aloft by a twin-engined Bf 110C. A total of ten test prototypes were completed:

Me 163 V4,	W.Nr. 0001, KE+SW	Me 163 AV9,	W.Nr. 0006, CD+IN
Me 163 V5,	W.Nr. 0002, GG+EA	Me 163 AV10,	W.Nr. 0007, CD+IO
Me 163 AV6,	W.Nr. 0003, CD+IK	Me 163 AV11,	W.Nr. 0008, CD+IP
Me 163 AV7,	W.Nr. 0004, CD+IL	Me 163 AV12,	W.Nr. 0009, CD+IQ
Me 163 AV8,	W.Nr. 0005, CD+IM	Me 163 AV13,	W.Nr. 0010, CD+IR

As important as the rocket aircraft development program was, the training of future rocket pilots was also of great importance. A substantial number of technical problems had to be overcome before the ten preproduction Me 163 A-0s, which were powered by the Walter HWK R II 203A/B rocket motor, could be used for training. Erprobungskommando (Testing Command) EK 16 was formed and was responsible for developing tactics tailored to the rocket interceptor's unusual flight envelope. EK 16 was established on October 5, 1942, at Peenemünde-West. Some of the Me 163As were employed as so-called flying testbeds, to evaluate the suitability of various weapon systems including the RZ 65 Rauchzylinder (smoke cylinder) rocket, plus conventional aircraft cannon such as the MG 151 and MK 108. In early

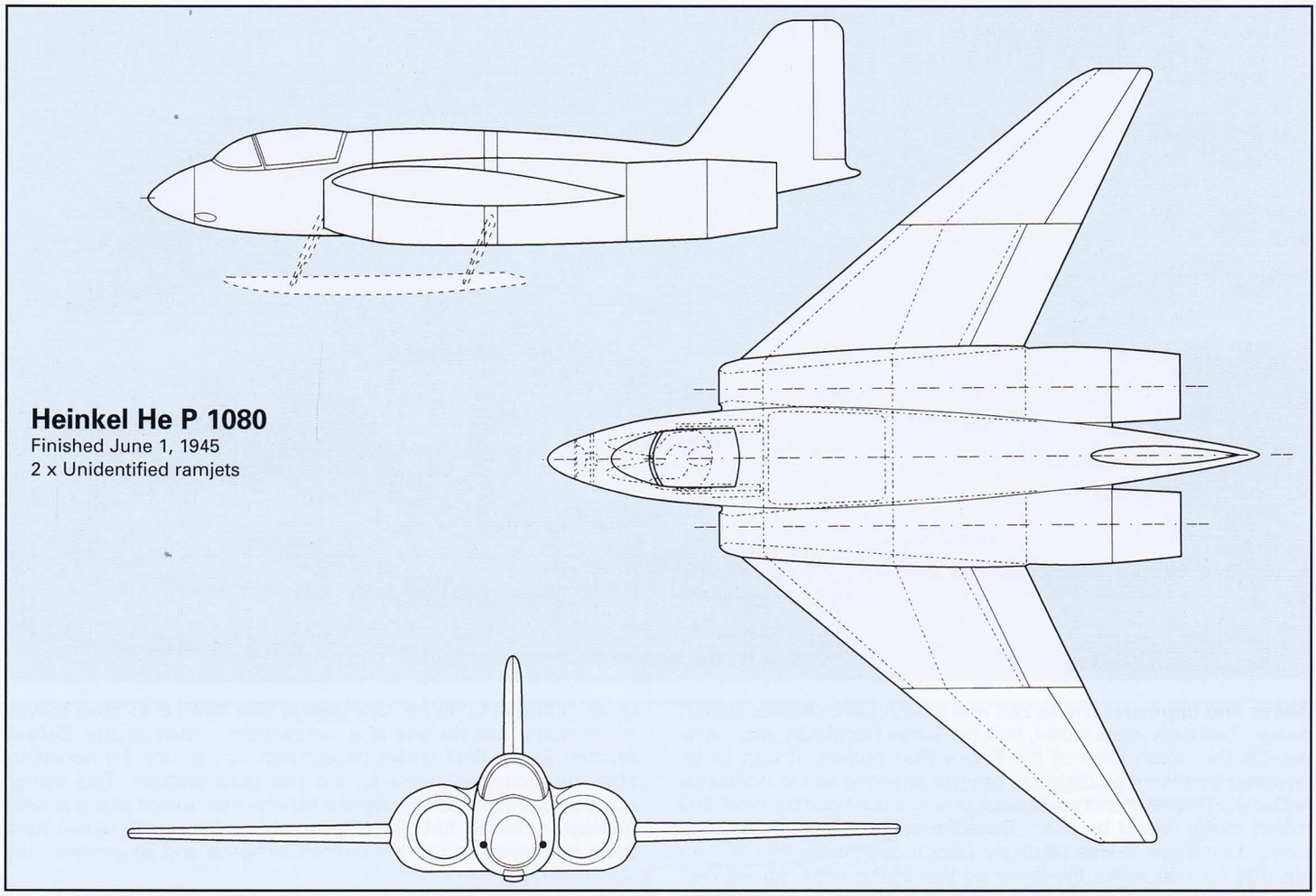
Above: The Heinkel He P 1080.01 was a twin-engined fighter to be powered by Sänger ramjets. Designed in 1945, the aircraft would have used four RATO units, plus a jettisonable takeoff trolley, to become airborne. Landing would have been accomplished with the aid of a single retractable fuselage-mounted skid. Heinkel believed the fighter would be well suited to stratospheric flight.

1945, one Me 163 — possibly the Me 163 V5 — was fitted with racks for twelve R4M air-to-air rockets under each wing. It is not known if the R4M installation proved successful, or if additional aircraft were assigned to the test program.

The Me 163A aircraft were essentially part of a comprehensive development program for the Li P 01-111 to 119 projects. By the Autumn of 1941, Alexander Lippisch had submitted his final plans for the full-production version of the Komet, what he labeled as the Li 163S (S – Series), which officially became the Me 163B production model.[23] Upon receipt of the RLM contract, construction of the B-series began in early October 1941. An initial batch of seventy B-series airframes was to be built by Messerschmitt at Regensburg. These Komets were considered B-series preproduction aircraft (B-0 aircraft) as well as prototypes (BV1 – BV70). Beginning with the twenty-third B-series aircraft, the Me 163 BV23, GH+IB, the Klemm firm at Böblingen was responsible for the rocket motor installation, the first of which began flight tests on June 10, 1942. Considerable delays occurred because of the unreliable HWK RII 211 rocket motors. Therefore, BMW advocated installing the BMW P 3390A to replace of the Walter motor, and immediate attempts were made to accelerate development of the P 3391 motor. Despite all efforts, motor development took much longer than anticipated, and the first Me 163 B-series prototype (VD+EK) and others had to be test-flown as high-speed gliders without engines.

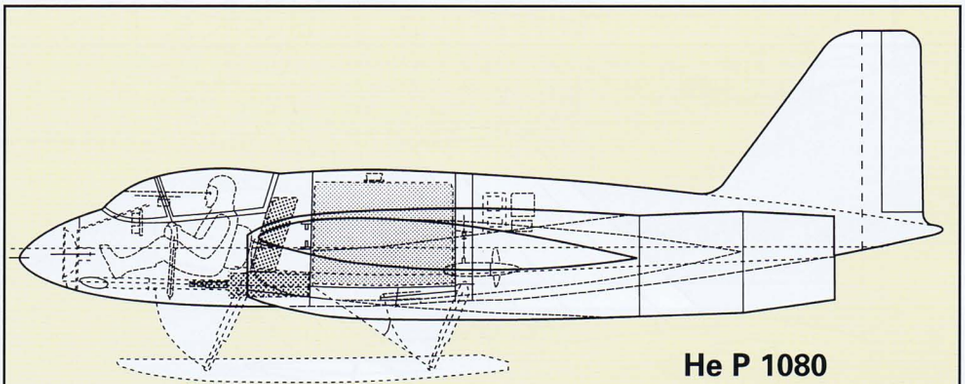
A top secret report, compiled by officers of the Peenemünde test establishment, who were not impressed with the Komet and they recommended an immediate cessation of further tests and termination of Me 163B production. Their

23 Lippisch would have prefered to have his name linked directly to the production Komet by using the first two letters of his surname as the official designation prefix; however, Messerschmitt disagreed. Because his firm was to produce the aircraft, his opinion prevailed.

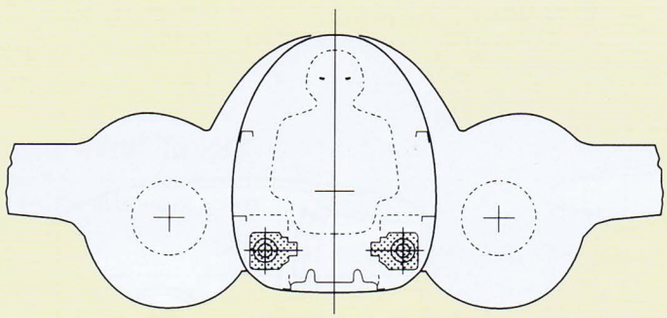


Heinkel He P 1080
Finished June 1, 1945
2 x Unidentified ramjets

This page: Various views of the He P 1080.01. The aircraft would have had a wing span of 29.2 ft (8900 mm), an area of 218 sq ft (20.0 m sq), an overall length of 26.75 ft (8150 mm) with a fuselage depth of 3.87 ft (1180 mm). It is interesting to compare the He P 1080 with the American Northrop X-4 of 1948. Although Northrop categorically denied being influenced by German projects, the X-4 twin-engined turbojet research aircraft is nevertheless remarkably similar to the Heinkel.

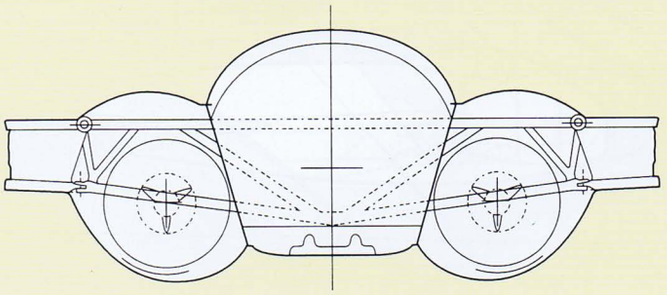


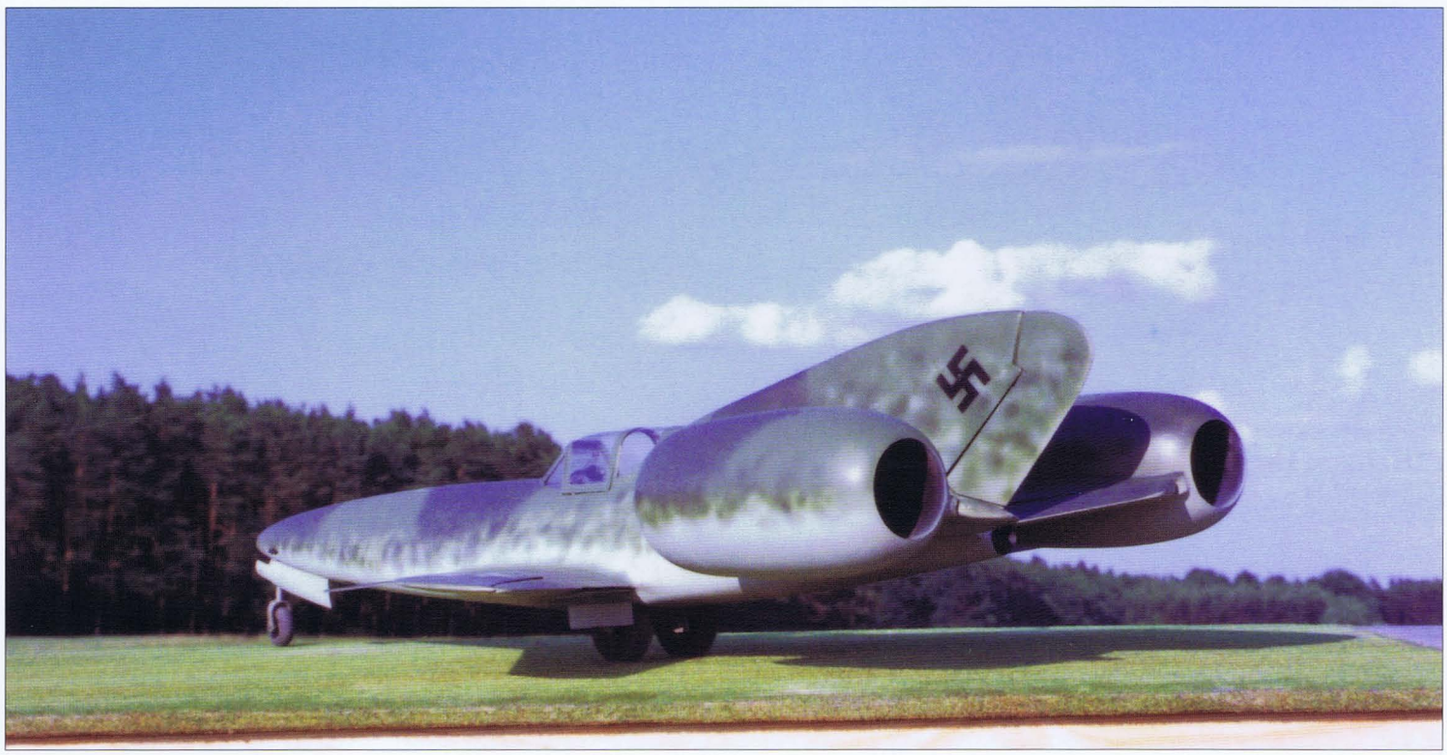
He P 1080
With landing ski extended



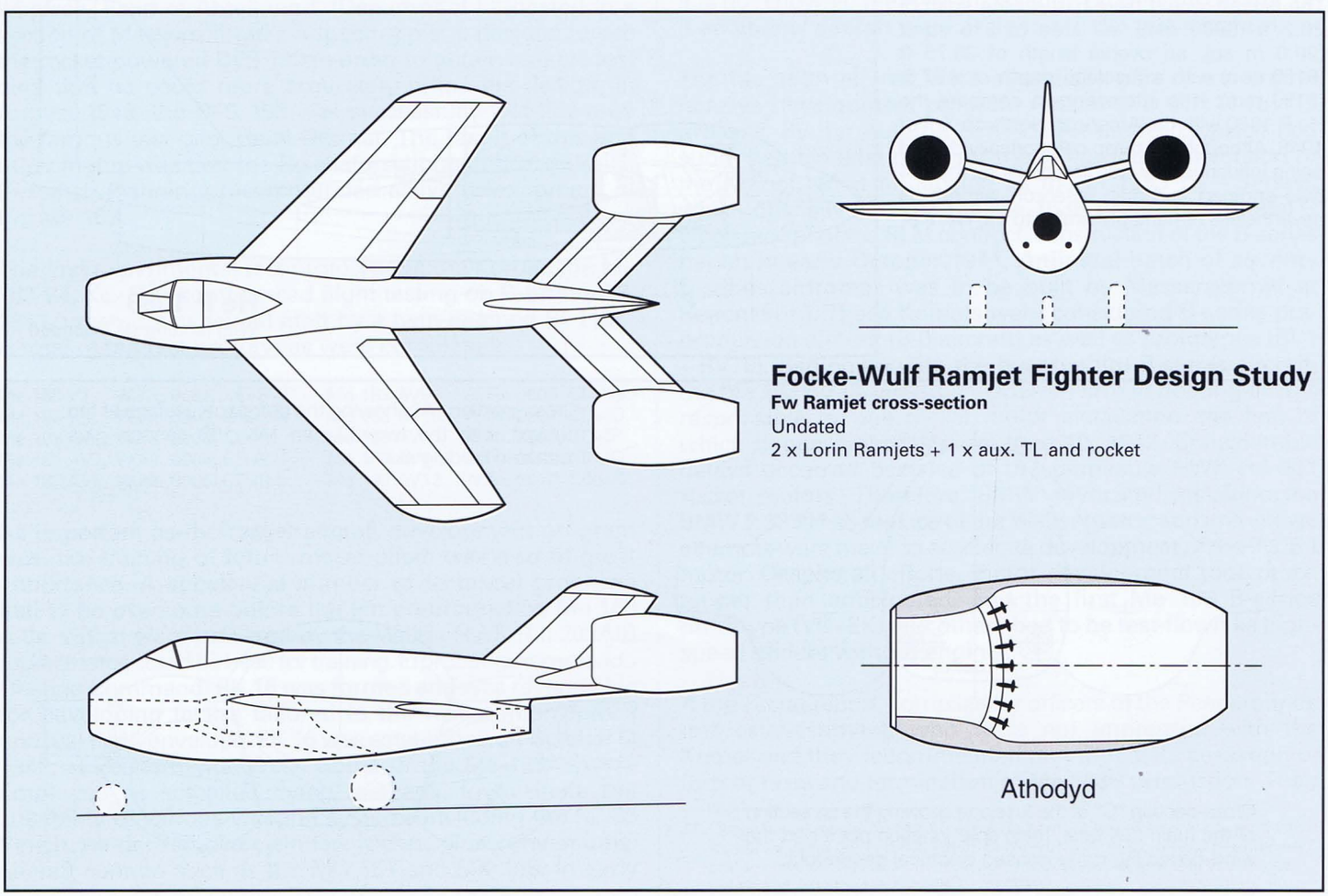
Cross-section "C" of the fuselage showing the aft section of the main fuel tank, main spar junction point and the wind-driven internally housed electrical generators.

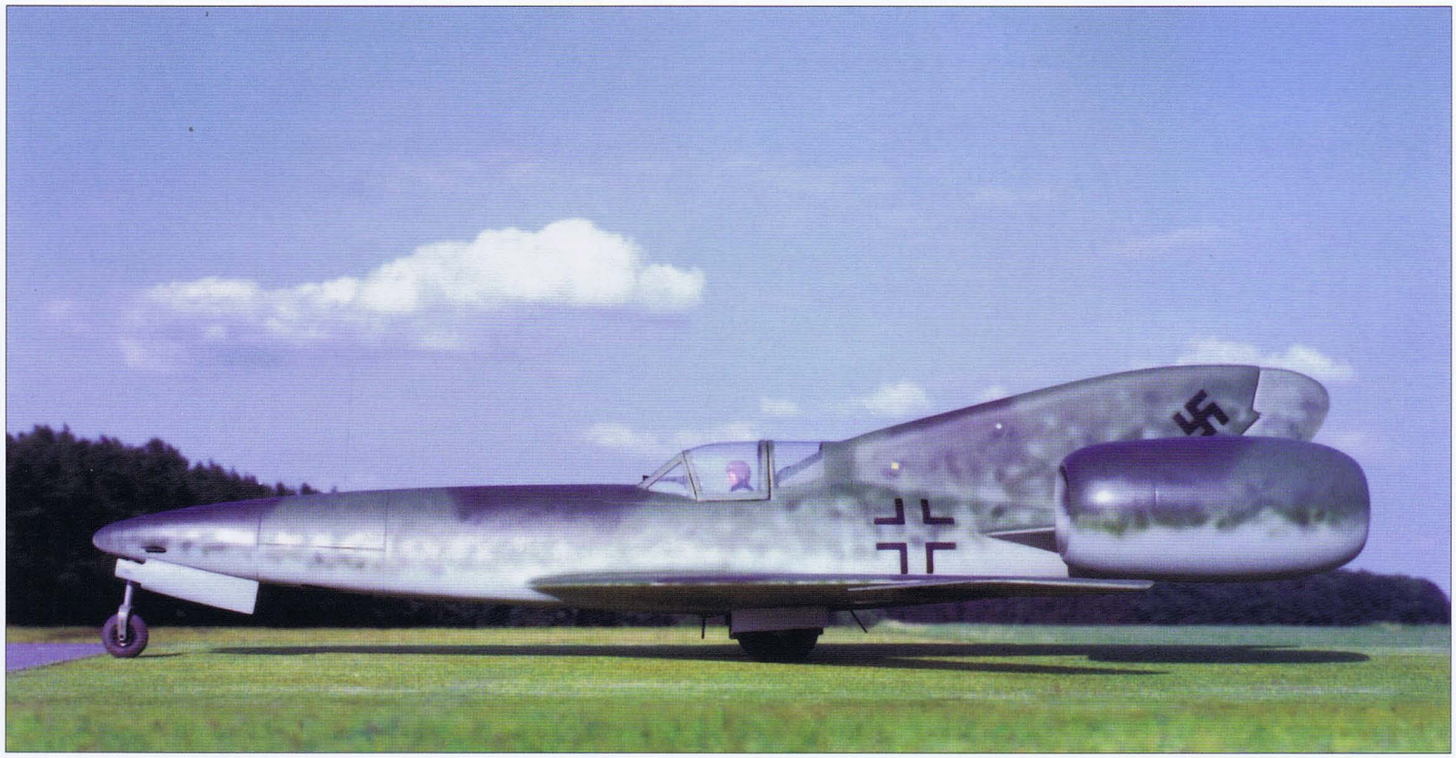
Cross-section "A" showing the compact fuselage at the cockpit with the two 30 mm MK 108 cannon plus retracted landing ski.

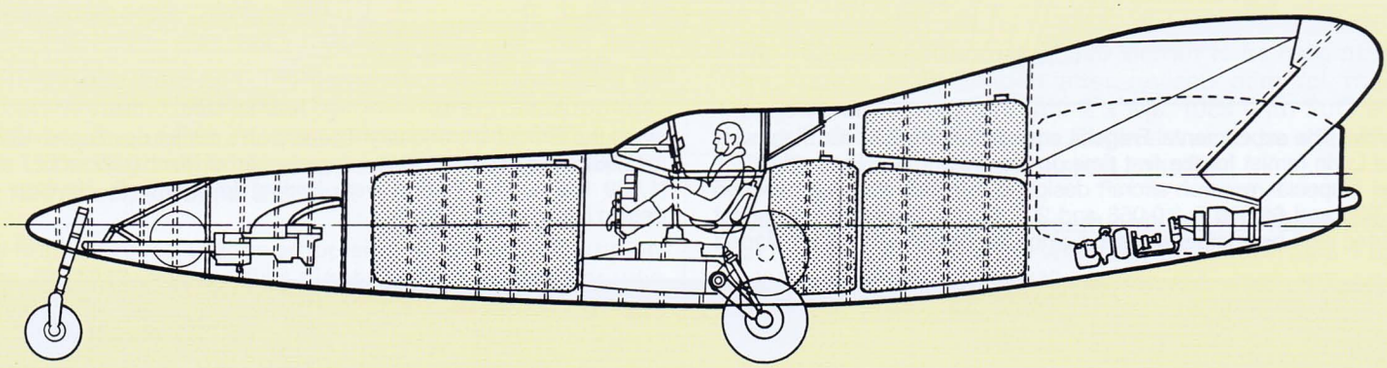




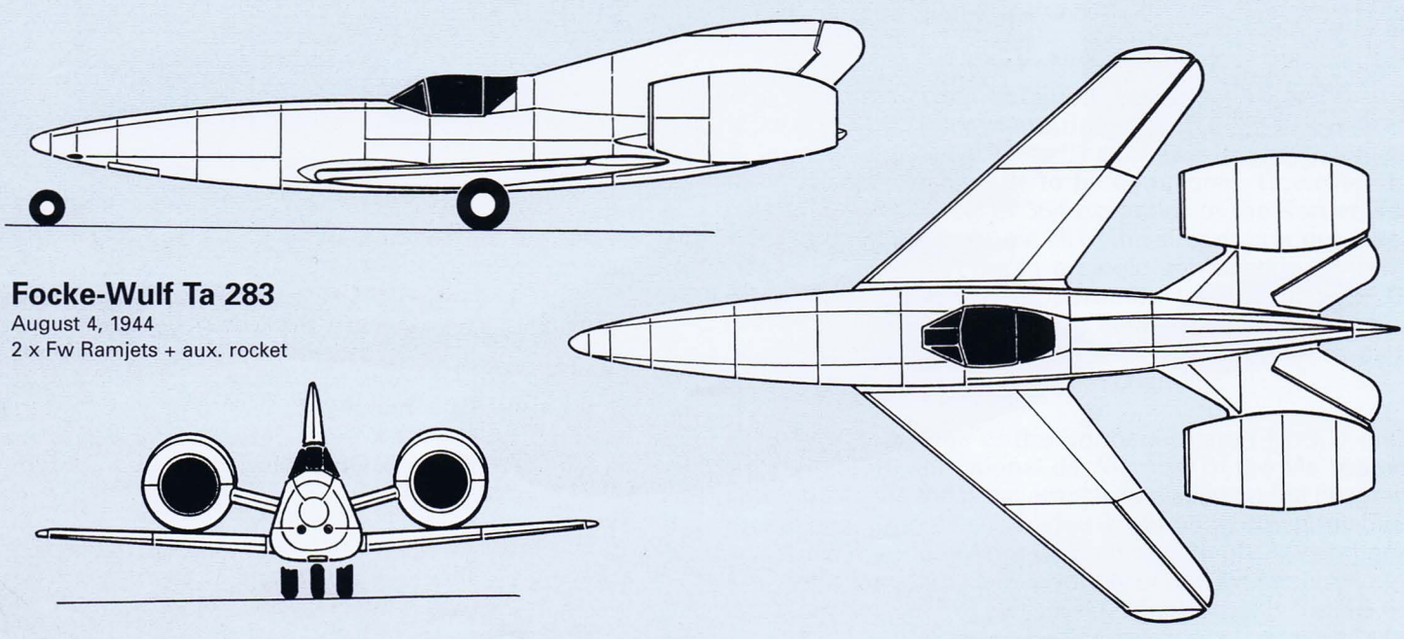
Above and opposite: The Ta 283 was a daring and unusual aircraft design. This large-scale model, built by Günter Sengfelder, accurately depicts the rakish lines of the Focke-Wulf project. It was to be powered by two large diameter ramjets attached to the horizontal tailplane. For takeoff and emergency power, a tail-mounted HWK 509 rocket motor would be used. Because of the exceptionally long forward fuselage, it was relatively easy to locate the two 30 mm MK 103 cannon within the lower portion of the nose. Focke-Wulf calculated its maximum speed at 684 mph (1,100 km/h) at an altitude of 35, 600 ft (11,000 m). One design flaw that could have proven troublesome was the use of a narrow track undercarriage. **Below:** Another Focke-Wulf ramjet project that was to use the horizontal stabilizer-mounting points for the two main engines. This design study also envisioned the use of a tail-mounted rocket plus a smaller fuselage-mounted turbojet. These two auxiliary units would have been employed to get the aircraft airborne and to increase the rate of climb.



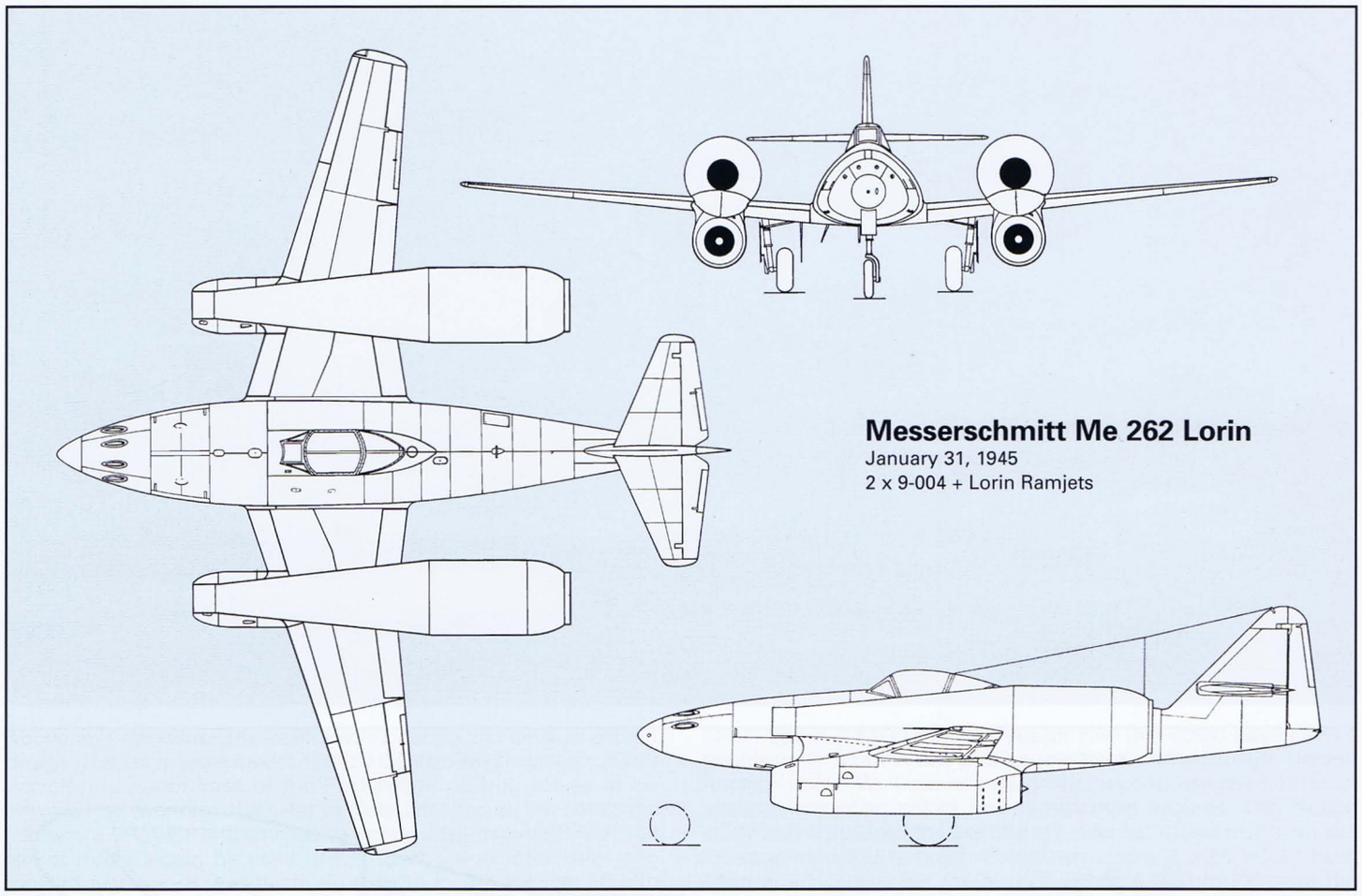




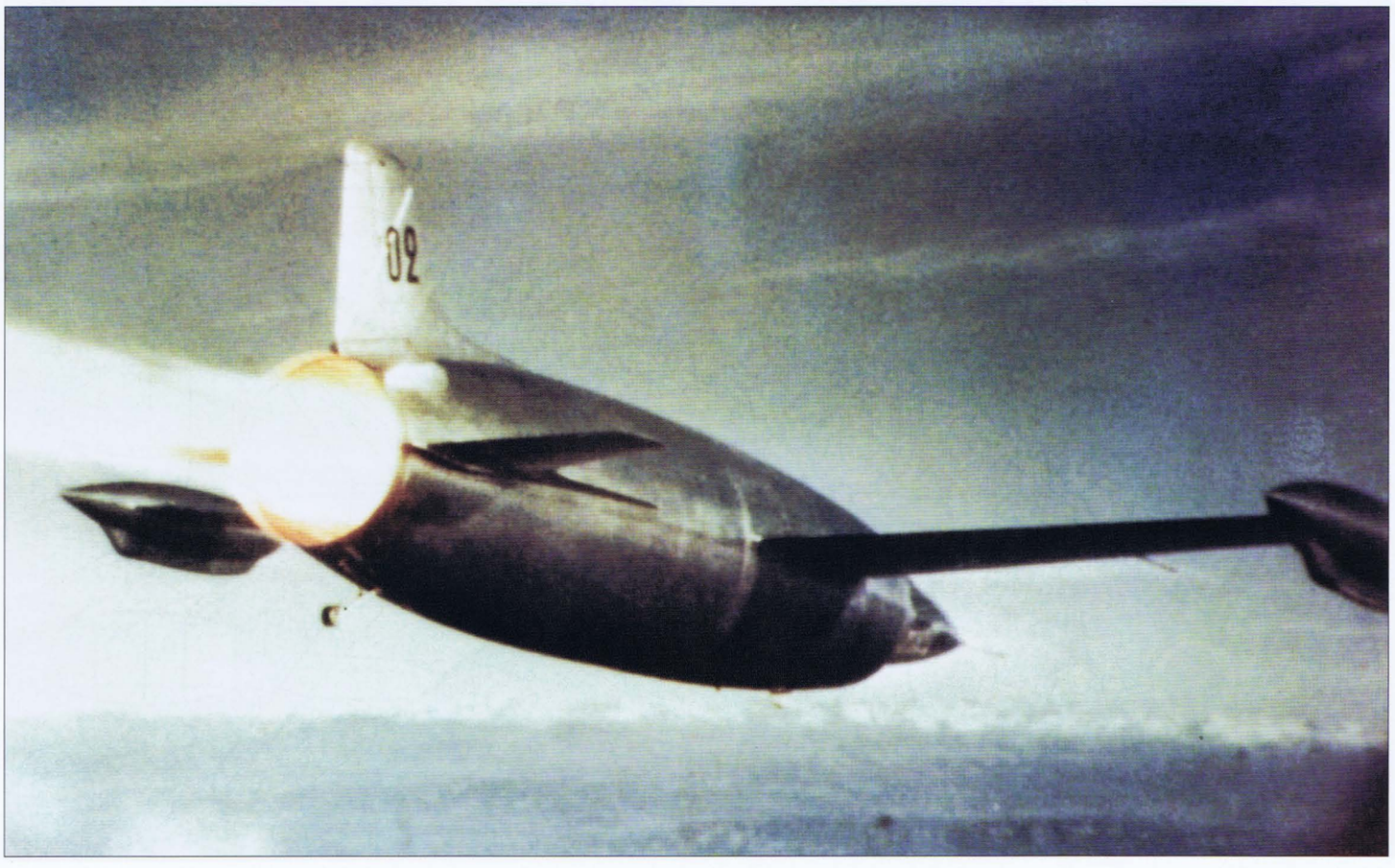
Focke-Wulf Ta 283

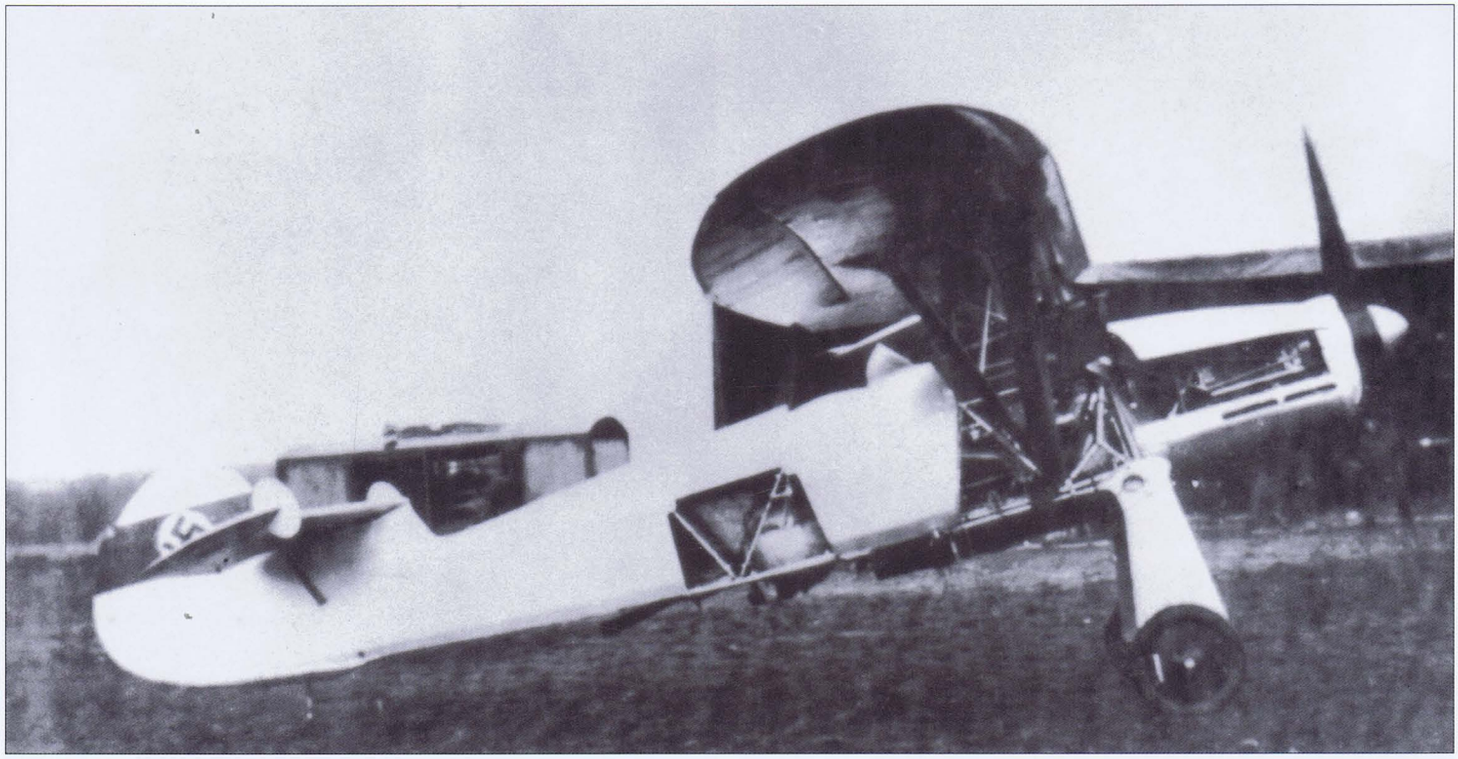


Focke-Wulf Ta 283
August 4, 1944
2 x Fw Ramjets + aux. rocket



Below: The experimental French Leduc 021-02 flies under the power of a Lorin ramjet for the first time on March 1, 1954. The Leduc 021 was a special research aircraft designed to reach altitudes between 33,000 and 66,000 ft (10,058 and 20,117 m). The aircraft was first carried aloft by a larger transport since the ramjet can not be started when the aircraft is stationary. The aircraft's ramjet developed 13,200 lb (5,987 kg) static thrust delivering a speed of Mach 0.85, or 627 mph (1,009 km/h). The French were hoping to eventually develop the design into a potent fighter.





Above: This Focke-Wulf Fw 56 "Stösser" (Hawk), D-INJY, was used to flight test a small rocket motor developed by Heinkel during the summer of 1939. The rocket was tested about 30 times delivering a thrust of about 440 lb (200 kg).

main reasons were poor flight endurance compounded by numerous engine failures that occurred during development. However, the rocket motors gained dependability over time to the degree that great expectations were attached to the Komet's operational success.

The first improved Walter propulsion unit was delivered on June 17, 1943, and the first flight under rocket power was made by the Me 163 BV21, W.Nr. 310030, VA+SS, on June 24, 1943. A short time later, a speed of 435 mph (700 km/h) was reached by this aircraft. In December 1943, more experimental aircraft had reached Peenemünde. Most of these were then transferred to Lechfeld and later to Bad Zwischenahn to correct technical problems, but at the expense of delaying deployment. In the summer of 1944, the first unit, 1./Jagdgruppe 400 (1st Squadron, Fighter Group 400), became operational with the Me 163B.

By this time, mass production of the Me 163B had been initiated by the RLM. Because the Messerschmitt firm was fully occupied with Me 262 production, the large Junkers was put in charge of production management of the B-series. Engaging the help of many small factories, it was hoped to turn out quantities of Me 163Bs; however, a shortage of parts made it impossible for Junkers to meet production schedules. Altogether, six different variants of the Me 163 B-series were to be manufactured:

Me 163 B-0 V1 through V70 assembled at Regensburg. Powered by the HWK 509A and armed with 2 x MG 151/20s up to the V45, or 2 x MK 108s with the V46 through V70. Electronics: FuG 25a plus FuG 16ZY.

Me 163 B-0/R1 Twenty assembled by Klemm at Böblingen in fulfillment of Me 163 B-0 and similar to V46 to V70.

Me 163 B-0/R2 Thirty assembled by Klemm at Böblingen. Similar to B-0 but with revised mass production wing 163 B-1 after drawings 163 F510 and F511.

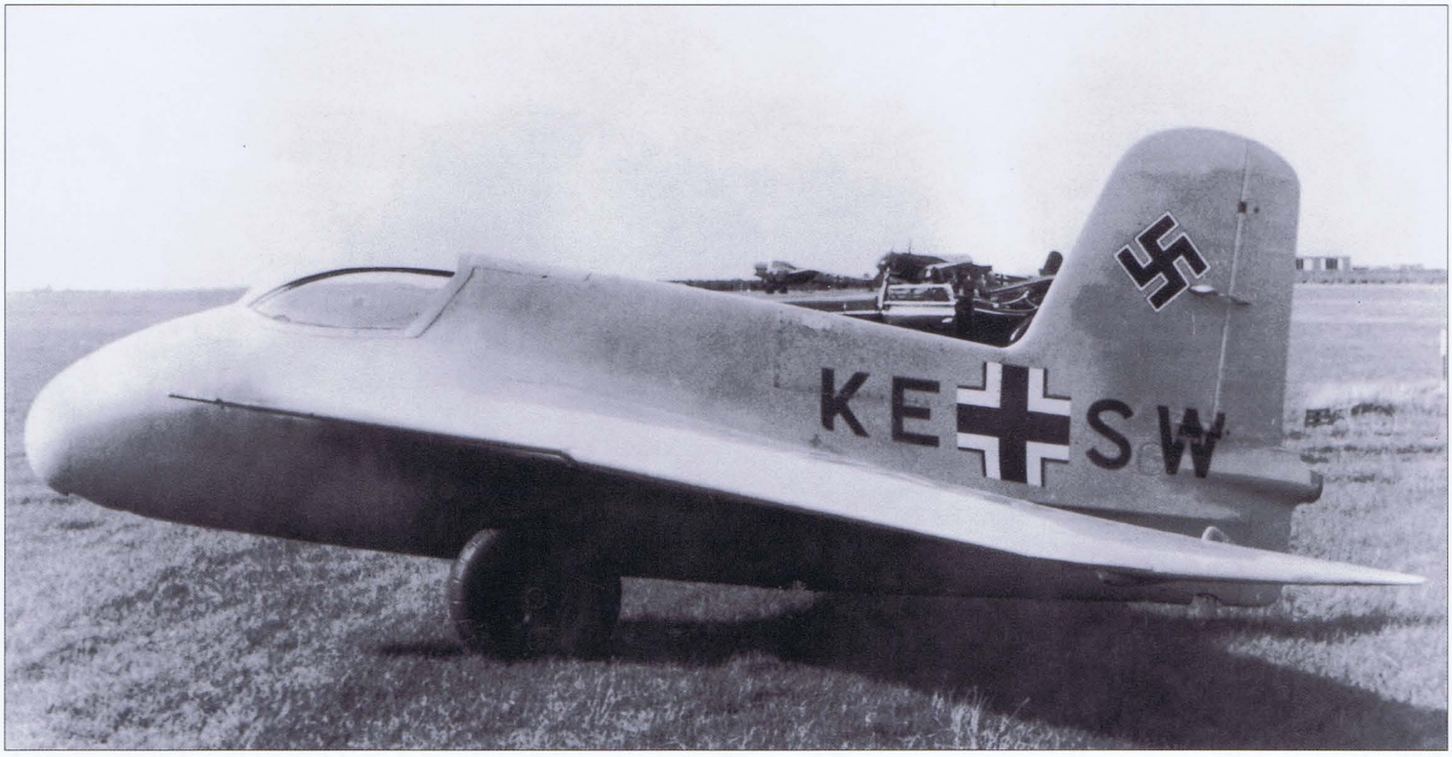
Me 163 B-1 Approximately 390 aircraft to be assembled by Klemm at Böblingen after revised data for mass production. Armament still 2 x MK 108s with FuG 25a and FuG 16ZY electronics. Engine was to be the HWK 509 B-1 *with* cruise combustion chamber.

Me 163 B-1/R1 Seventy aircraft ordered. Forward portion of fuselage similar to B-0 with the rear portion as B-1 but with older fin-rudder. Wing was standard B-1 after drawings F510 and F511. Engine was the HWK 509 B-1 *with* cruise combustion chamber. Armament and electronics unchanged.

Me 163 B-2 Standard series production version to be assembled by Klemm at Böblingen. Armament standard at 2 x MK 108s and electronics including FuG 25a plus FuG 16ZY. Engine was the HWK 509 B *without* the cruise combustion chamber.

The foregoing list, obtained from an April 26, 1944 Messerschmitt document, does not indicate how many B-1s were actually completed, nor does it attempt to indicate the total number of B-2s to be completed. However, it is estimated that a total of 364 examples of the Komet were produced by 1945. Almost all of the aircraft produced were powered by engines with a single combustion chamber. Since there was little opportunity to manufacture the Walter HWK 509B engines in significant numbers, those attempts were made to assemble this motor from parts, without the second combustion chamber.

Due to the shortage of the Sonderkraftstoff (rocket fuels) C- and T-Stoff, operational deployment of the Me 163 was limited. Despite the great emphasis placed on the program, operational Komets succeeded in shooting down relatively few American heavy bombers. Interestingly, a number of Me 163Bs were fitted with a variety of new weapon systems, including the SG 116 and SG 117. Additionally, the SG 500 was tested, but it too never became available in quantity.



Above: The first prototype of the Messerschmitt Komet was the Me 163 V4, W.Nr. 0001, KE+SW, in spite of the fact it bore v-number 4 (V - versuch/test). This anomaly is explained because the first three versuch aircraft for the RLM GL/C number 163, were previously earmarked for the Messerschmitt Bf 163; an earlier unsuccessful lightplane project having no relationship to the rocket interceptor.

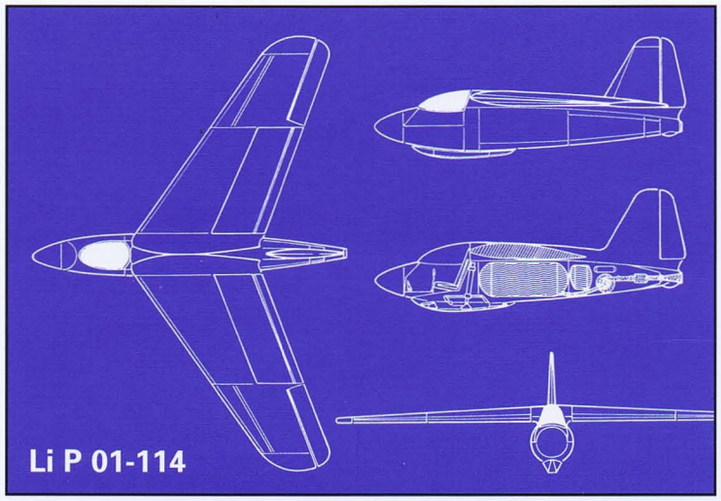
When Lippisch finalized the design the Me 163B interceptor, he proposed an improved combat aircraft with improved performance. This new series, the Me 163C, would have been both much faster and enjoyed a longer time on station, but it still relied on a centrally-mounted skid for landing. This limitation made it difficult to retrieve aircraft upon landing, thus rendering them vulnerable to attack. The armament was to be increased up to four MK 108s to be fitted in pairs in the wing roots. Later, the armament was to amended to two MK 108s and two MK 103s each. The installation of the HWK 509C with its twin combustion chambers was to be standard. At the end of March 1944, four Me 163C prototypes were under construction at Oberammergau. For the production Me 163C, the projected flight endurance was about nineteen minutes, permitting a speed of about 374 mph (600 km/h) for 9.75 minutes of powered flight.

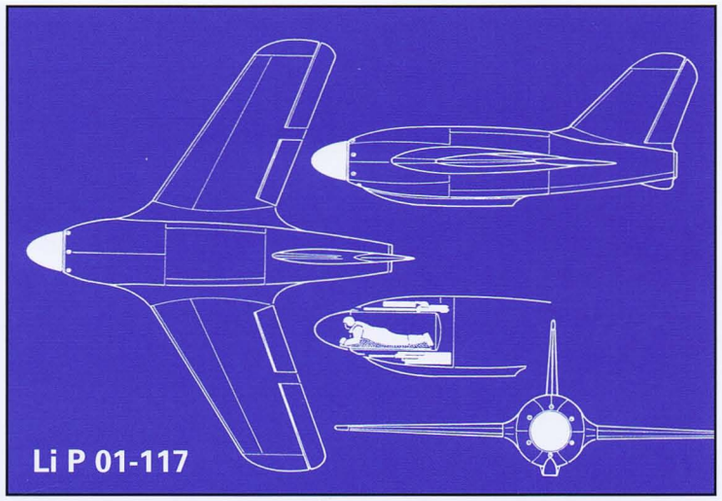
Development of the Me 163C continued, even though it was recognized that the next generation of rocket interceptors, such as the Me 263, was considered to be much superior. On September 19, 1944, the comprehensive flight test schedule for the Me 163C had been completed. But, because of Junkers' limited production capacity at Dessau, the airframes were moved back to Bavaria. There are no reliable reports about their fate during the closing weeks of the Second World War.

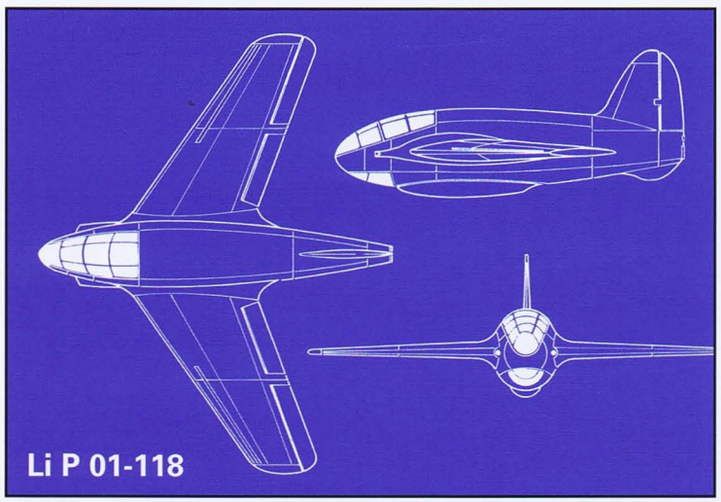
The proposed Me 163D, essentially an elongated variation of the Me 163 B-series, featured a lengthened fuselage to accommodate an increased fuel capacity. Design work on this series was aborted in 1944, since development of the Me 163 had run its course. Moreover, the new Me 263 promised greater range, increased endurance and was equipped with a retractable undercarriage. Two test aircraft equipped with new twin combustion chambers, the Me 163 BV13, VD+EV, and BV18, VD+SP, were test flown. The BV18 commenced flight evaluation in December 1944, which extended through February 1945, while the BV13 was captured on April 16, 1945, by Allied forces at Brandis, near Leipzig.

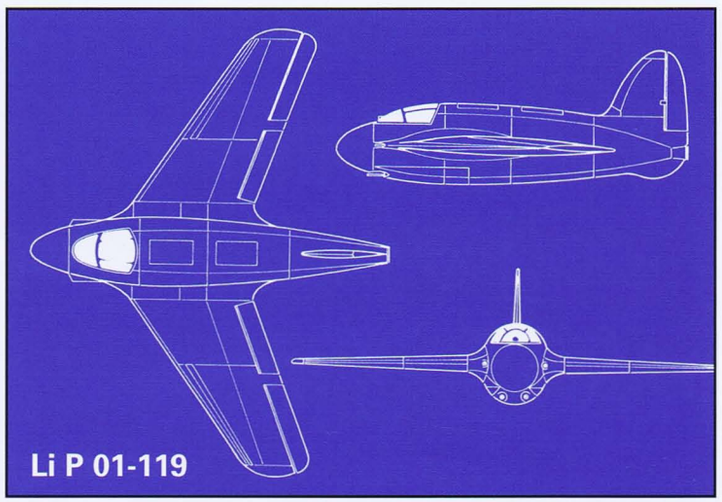
Junkers engineers were chiefly responsible for the development of the rocket-propelled interceptor prototype for the Me 263 series. Receiving the RLM-approved designation Ju 248, the design was broadly based on the Me 163C but incorporated a fully retractable undercarriage. The Ju 248 V1, W.Nr. 381001, DV+PA, had a much slimmer, bullet-shaped fuselage, and improved aerodynamics. Adequate armor protection was provided for the pilot. The pressurized cockpit was firmly bolted to the main fuselage, while the rear fuselage was detachable. The fuselage was of semi-monocoque construction and was divided into three main sections. The Walter HWK 509C rocket motor incorporated twin combustion chambers with the smaller cruise chamber located immediately below the main unit. The C- and T-Stoff fuel tanks were emptied in flight in a specified sequence in order to minimize center-of-gravity shift. A first full-scale wooden mockup was inspected at Dessau on September 25, 1944. At the same time, tests were carried out involving development of a brake parachute, as well as modification to the fin and rudder design and the installation of the fully retractable undercarriage.

The first experimental aircraft was under construction in January 1945, when the OKL demanded mass production of the improved rocket fighter. After the first flight on February 8, 1945, and other tests during the month, further work on the Me 263 A-1 was stopped, because the limited production capacity available was needed for the Me 262 and He 162 jet fighters. Although the Chef TLR had canceled the Me 263 program, a small number of Me 263 airframes were completed by Junkers. It is noteworthy that 18 incomplete airframes were found by British forces at Husum. The ultimate fate of the three test prototypes Ju 248 V1 - V3) is not known, with the exception of parts of a wrecked aircraft discovered at the northern end of Dessau airfield. Pilots engaged in flight development maintain that a few Me 263s had been completed by April 1945.

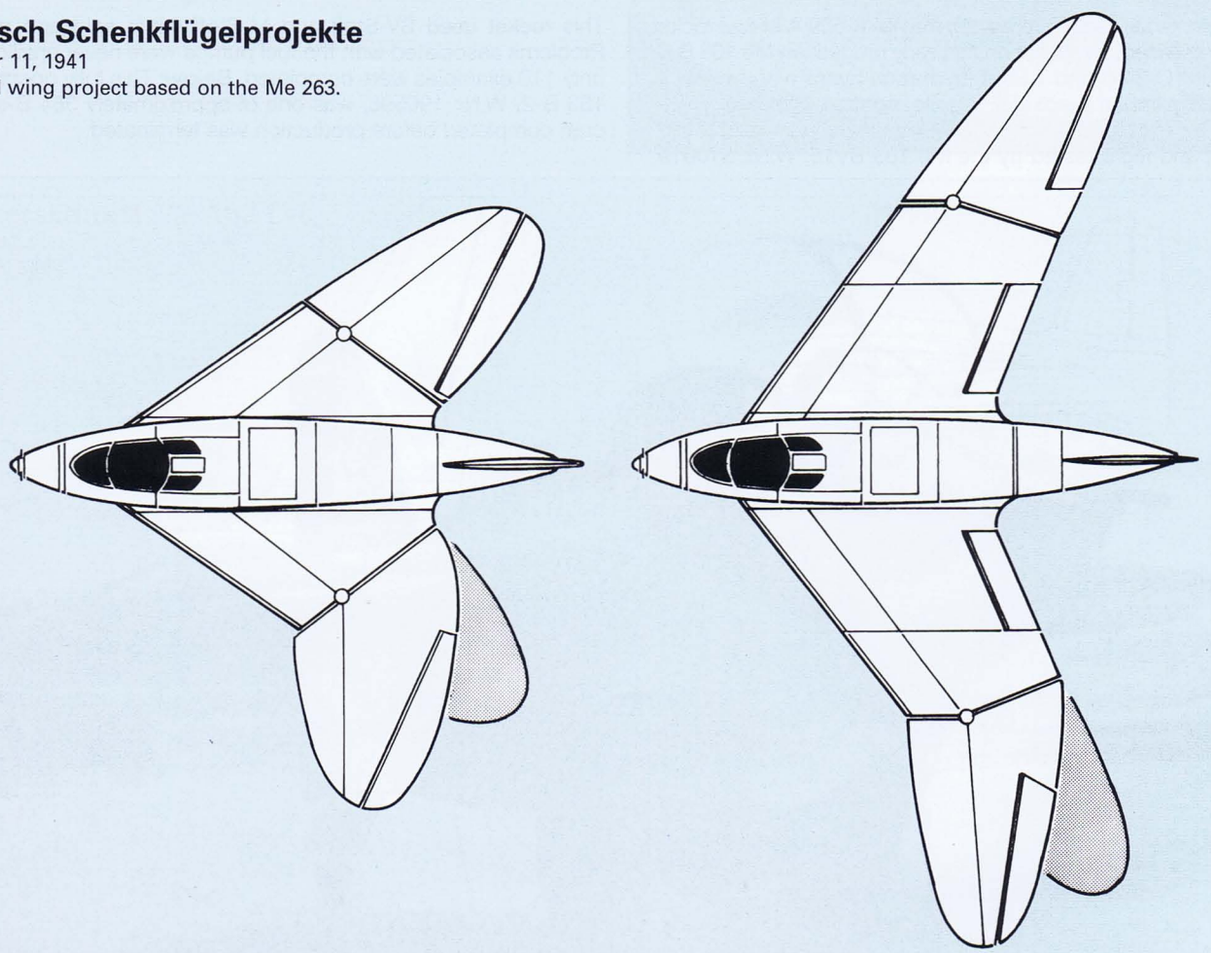


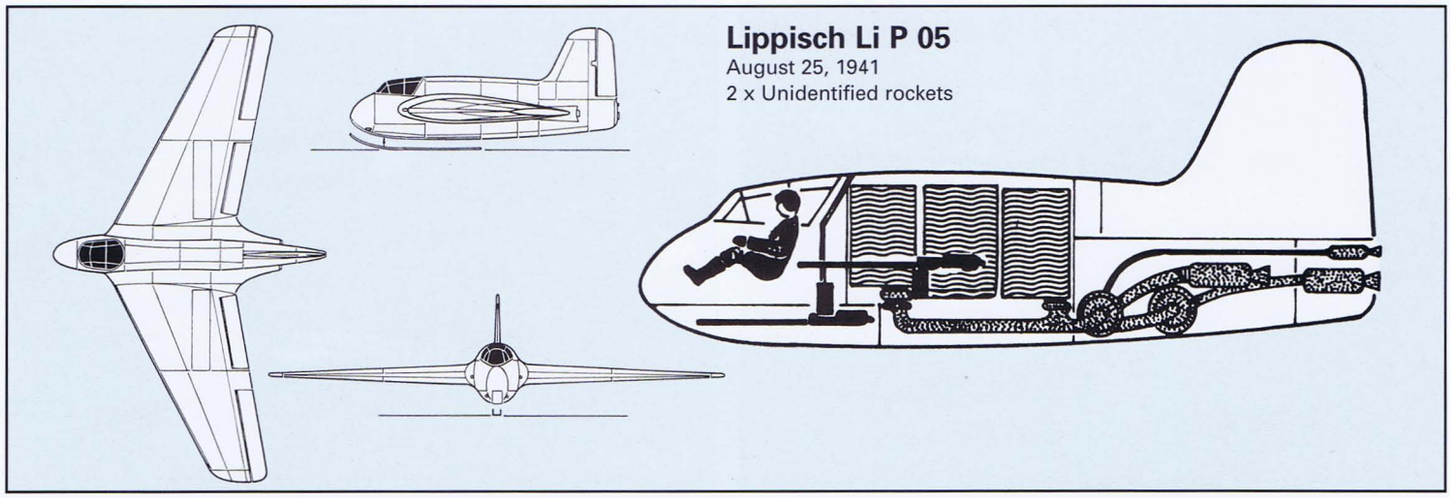


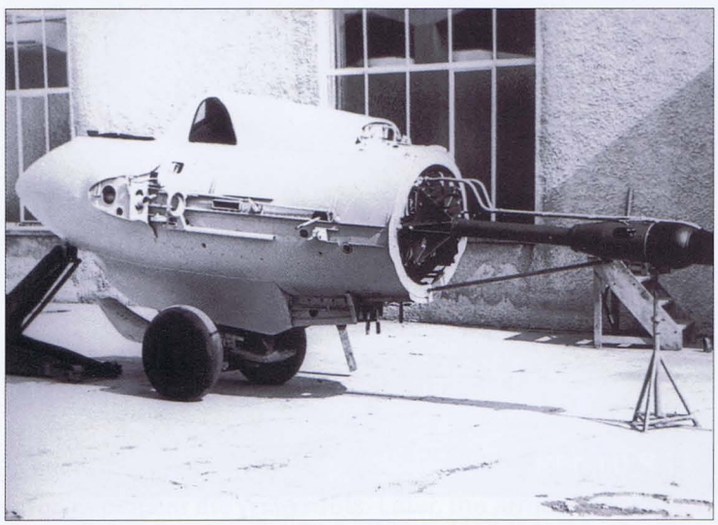


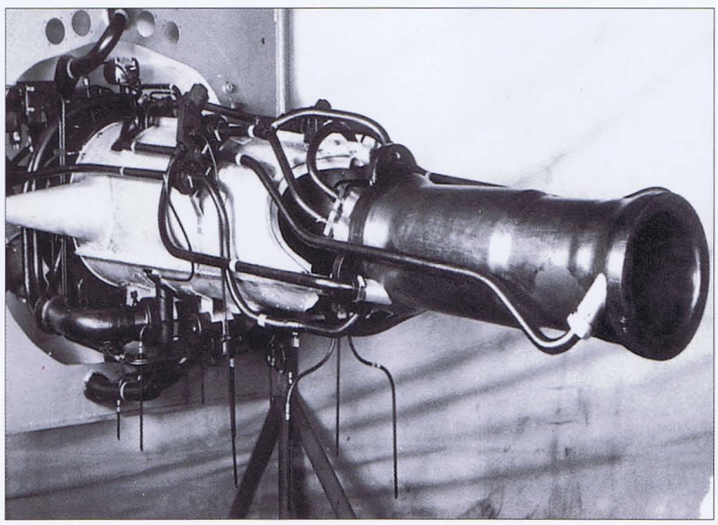


Lippisch Schenkflügelprojekte
October 11, 1941
Swievel wing project based on the Me 263.

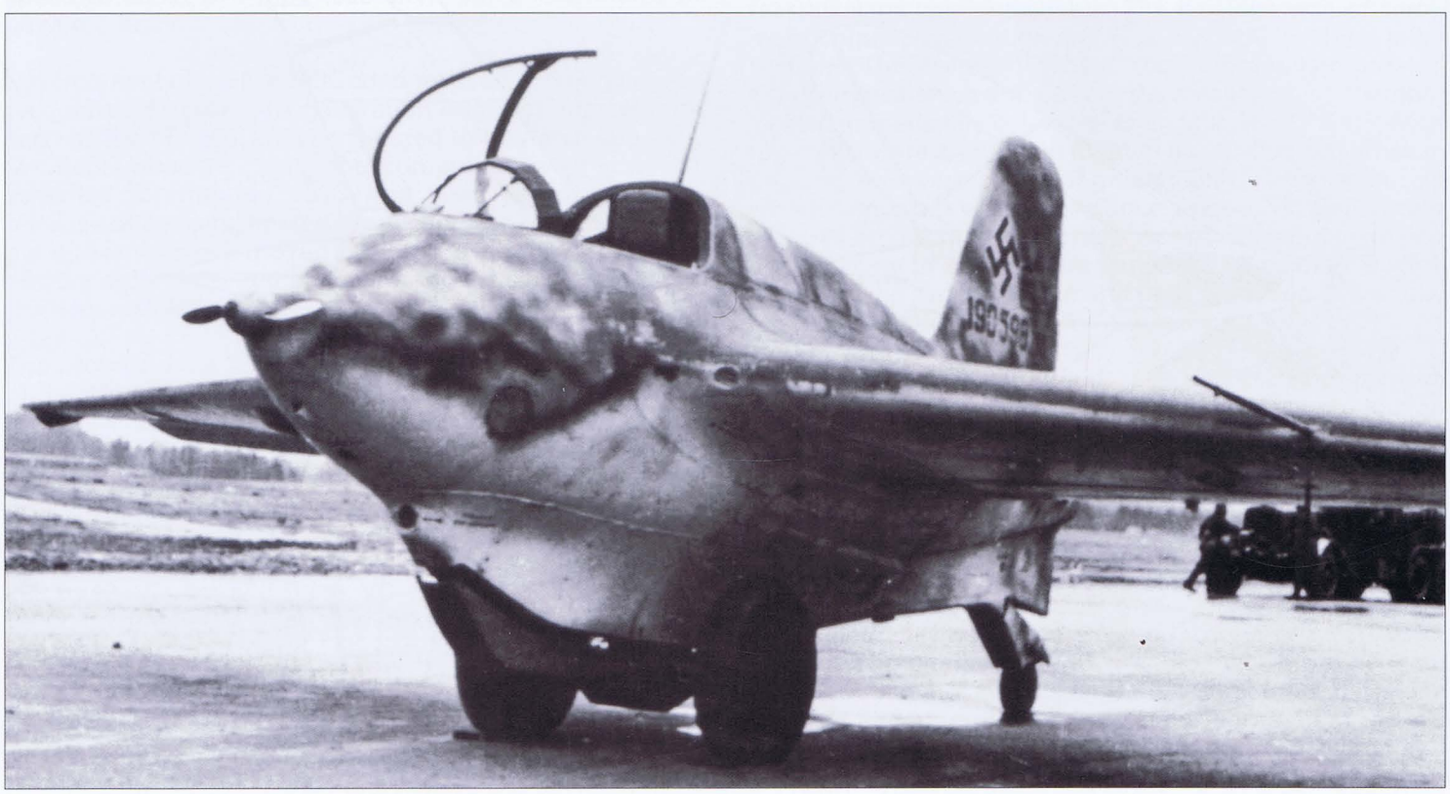




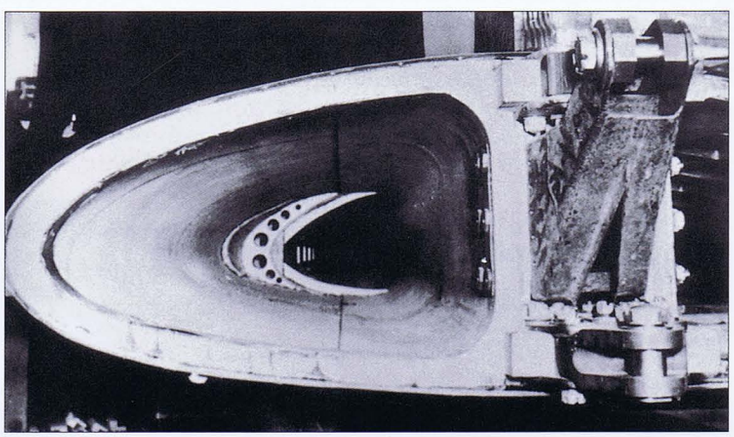


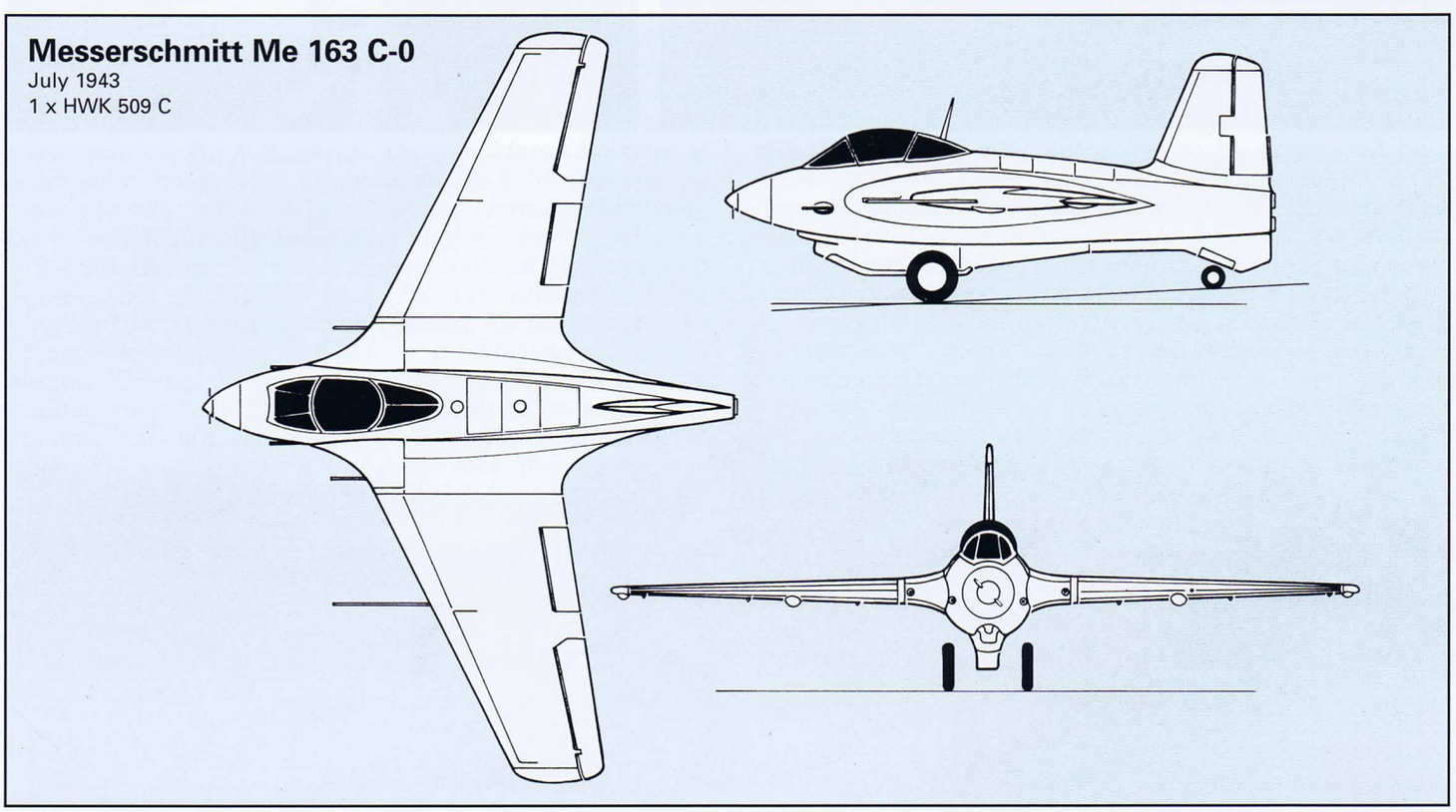


Above left: With its tail section removed, the HWK 509 A bi-fuel rocket motor is easily serviced, as shown on this early production Me 163 B-0. This rocket used C-Stoff and T-Stoff (hydrazine hydrate and water in methanol plus hydrogen peroxide). **Above right:** A close-up of the experimental BMW 510 A (BMW P 3390 A), developed in parallel with the HWK 509, and flight tested by the Me 163 BV10, W.Nr. 310019. This rocket used SV-Stoff and M-Stoff (nitric acid and methanol). Problems associated with the fuel pumps were never eradicated and only 110 examples were completed. **Below:** This fully operational Me 163 B-2, W.Nr. 190598, was one of approximately 364 B-series aircraft completed before production was terminated.

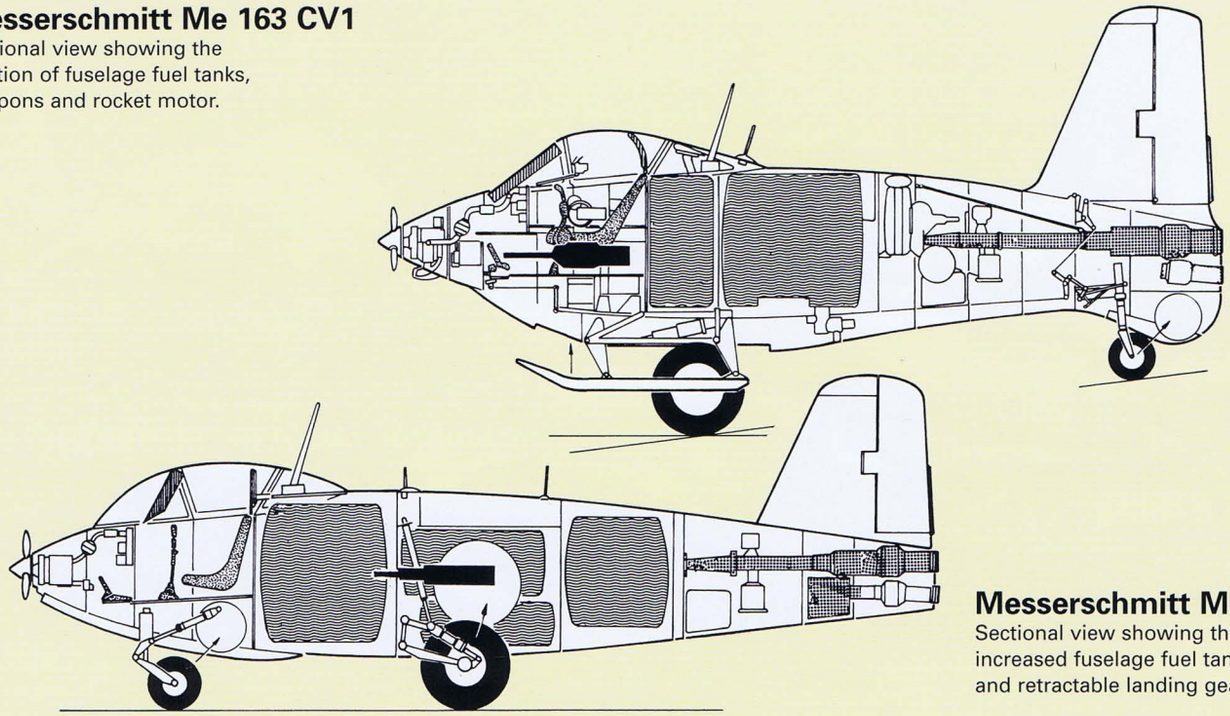


Above: Six captured Me 163 Bs have been carefully loaded onto US Army trucks at Merseburg for their journey to the United States for test and evaluation. The Komet fuselage in the foreground belongs to Me 163 B-0 (V42), W.Nr. 310051, PK+QM. The second fuselage appears to belong to a Me 163 B-1/R1. The remainder are unidentified. **Right:** A close-up of one of the fuel tanks contained in the leading edge of a wing intended for the Me 163 C. This is one of the rare authentic photographs pertaining to the C-series.

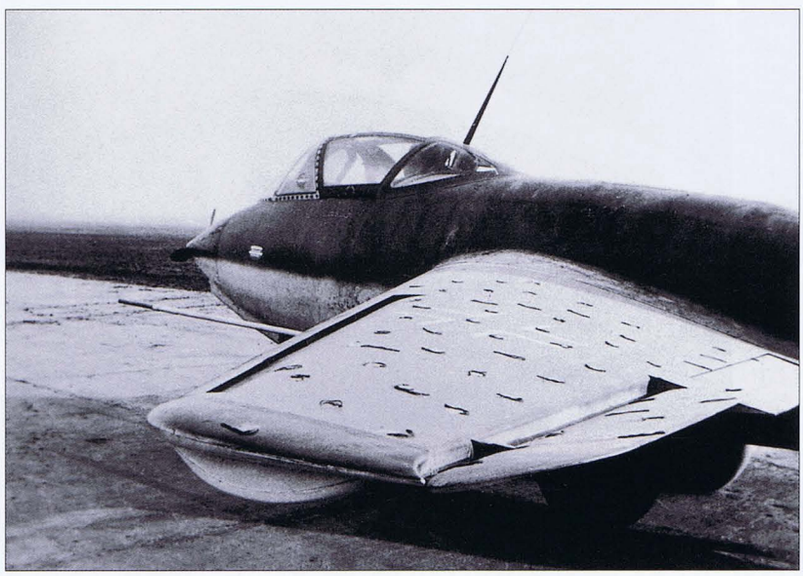


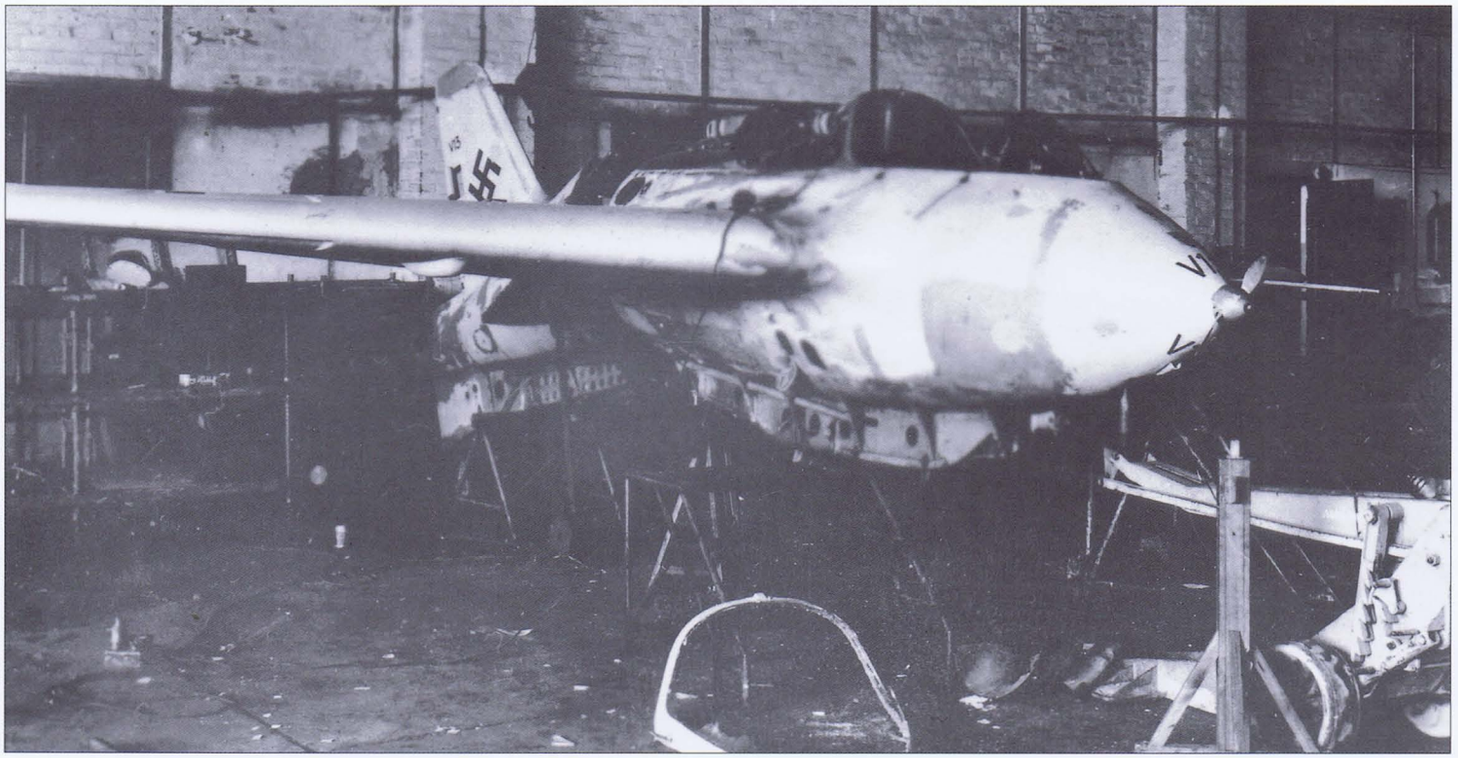


Messerschmitt Me 163 CV1
Sectional view showing the location of fuselage fuel tanks, weapons and rocket motor.



Messerschmitt Me 263 A-1
Sectional view showing the increased fuselage fuel tankage and retractable landing gear.





Above: The damaged Me 163 B-0 (V13), W.Nr. 310022, VD+EV, found at Brandis airfield. **Opposite left:** A full size mockup of the forward fuselage of the Ju 248 constructed by Junkers at Dessau. **Far Left:** The Ju 248 V1 with air flow tufts attached to the port wing. **Opposite lower:** A rear view of a large-scale model of the Me 263.

Early in 1945, neither the Me 163 nor the Me 263 had been included in the Führer-Notprogramm (Hitler's emergency fighter program). On February 10, 1945, the OKL decided to cancel all further activities because the war situation did not permit production of any significant number of such aircraft and their exotic fuel. Apart from the Me 263, two additional aircraft designs, referred to as Heimatschützer (Homeland defenders) and possessing composite power, were being invesitigated in 1945.

Several other approaches in designing a more powerful, yet inexpensive, single-seat fighter powered by the Walter HWK 509 or one of the new BMW rocket motors were made in addition to the Me 163 experimentals. One of these was the BV 40B, which was considered for several alternative propulsion units. One version was to be equipped with a HWK 509 in the rear fuselage. Originally conceived as an engineless glider-fighter, the BV 40[24] was to be towed into the air by a conventional piston-engine fighter, such as the Bf 109 or Fw 190, and then attack bomber formations in gliding descent. To be able to take off under its own power rather than with the help of a towing aircraft, Dr.-Ing. Richard Vogt proposed converting the engineless BV 40A, about ten prototypes of which had been built by late summer 1944. Since the small airframe precluded installation of large fuel tanks, the project was dropped due to its marginal estimated combat range.

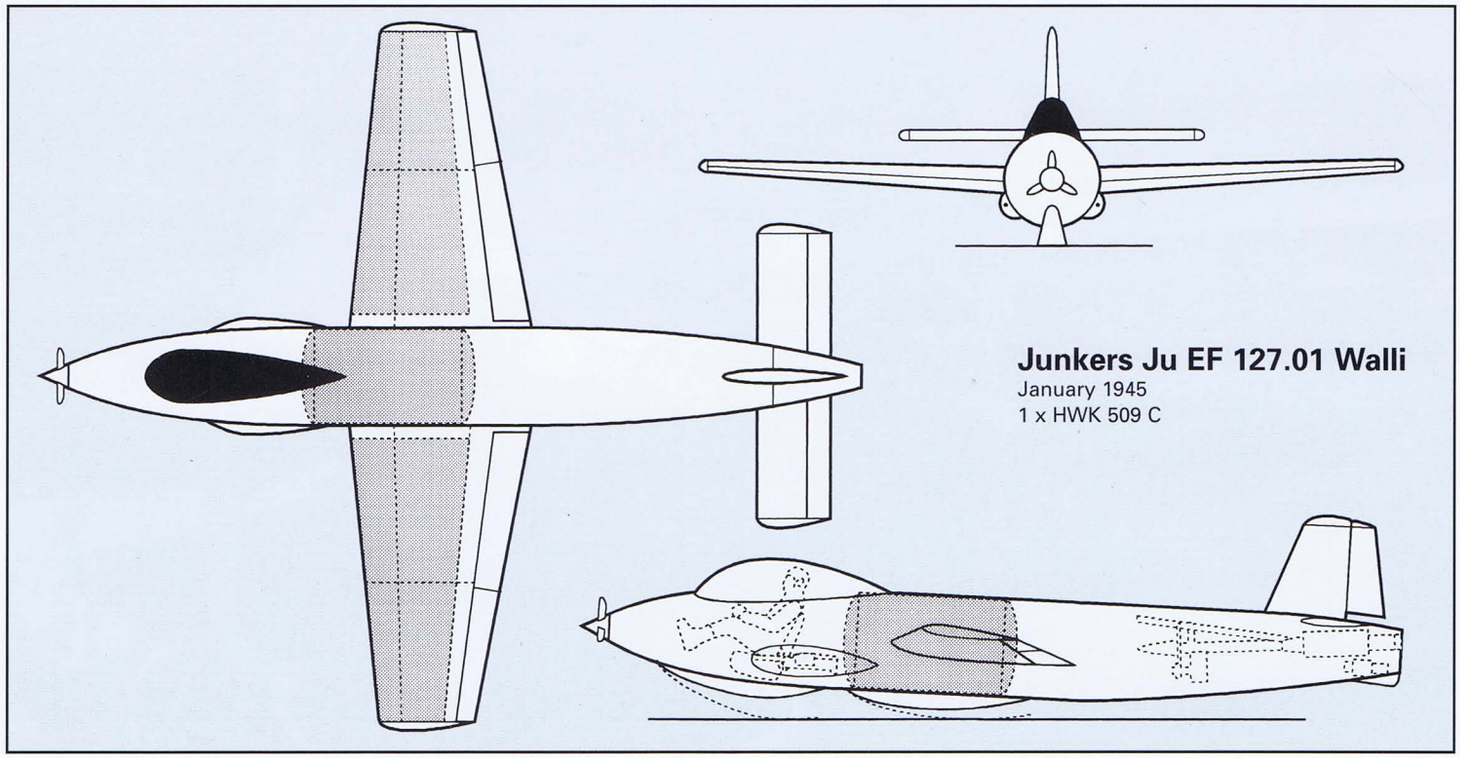
Earlier, on May 24, 1942, the Messerschmitt Werke had complete preliminary investigation of a rocket-propelled version of the Me P 1092A jet fighter under the designation P 1092B (see p. 27). Later, three further variants, the Me P 1092C Schnellbomber (fast bomber) powered by two As 014s, the P 1092D destroyer and high-altitude fighter, and finally, the P 1092E two-seat night fighter were designed. Only the rocket-powered version stood a chance, due to the inferior performance of the other versions. Finally, Hans Hornung was obliged to abandon further work in this direction in favor of the Me 163 rocket fighter.

The Junkers Werke advanced a small single-seat fighter, the Ju EFo 11, powered by two Walter rocket motors suspended in pods mounted below the forward fuselage. This was only a design study and no plans were made to pursue the concept.

The next Junkers rocket-propelled aircraft, that was developed was the Ju EF 127 Walli. This project was a small single-seat target-defense interceptor, designed to the same specification as the better-known Bachem Ba 349 Natter (see p. 164). It was to be equipped with one Walter HWK 509 C rocket motor and differed little from the pulsejet-powered Elli described earlier. As originally conceived for takeoff, the Walli interceptor was to be positioned on a three-wheeled trolley with two auxiliary RATO units, mounted beneath its wings, having 2,200 lb (1,000 kg) static thrust each. Once airborne, the trolley would be released as the aircraft climbed to its operational altitude. Landing would have been accomplished with the aid of two retractable fuselage-mounted skids; a slightly enlarged version was devised with a lengthened fuselage to accommodate more fuel. Representatives from the RLM expressed great interest in Walli, but the RLM requested that Junkers devise a simplified takeoff system without the trolley. Consequently, a third version was advanced which would have utilized a jettisonable tricycle undercarriage in which each member would be dropped upon takeoff for reuse. Landing would still rely upon the fuselage-mounted skid. At an operational altitude of 32,800 ft (10,000 m), a speed of 497 mph (800 km/h) was expected. Having reached this altitude with the help of two RATO units, the aircraft's operational range was estimated to be about 75 miles (120 km), before its fuel was consumed.

In comparing the estimated performance figures for the Natter, Julia, Walli, and the Ju 248, it was determined that

24 The RLM GL/C number 40 had previously been assigned to the German Gliding Research Institute in 1937 for their DFS 40, an experimental tailless glider designed by Lippisch, and powered by an Argus As 10C driving a pusher propeller.



Walli would have taken second place behind the Ju 248. Using this data, the Chef TLR therefore terminated further development in early 1945. A premature decision, as many thought at the time.

The Arado design bureau also tried its hand at designing a rocket interceptor with their Ar TEW 16/43-13 Raketenjäger. Considered an internal development study, Arado never entered the design in any of the fighter competitions. The design, a low-wing fighter with a takeoff weight of 10,250 lb (4,650 kg), was completed on March 15, 1943. Two fuel tanks occupied most of the fuselage. The proposed armament was two 20 mm weapons fitted on the sides of the cabin and a further 30 mm MK 103 in the lower front fuselage. The undercarriage of this low-wing aircraft, which was expected to reach a speed of 528 mph (850 km/h) and a ceiling of 58,000 ft (17,700 m), consisted of three large ball-shaped wheels, which were the only components of the aircraft design actually tested in 1943. Due to Arado's preoccupation with the Ar 234, little attention was paid to the rocket-powered project.

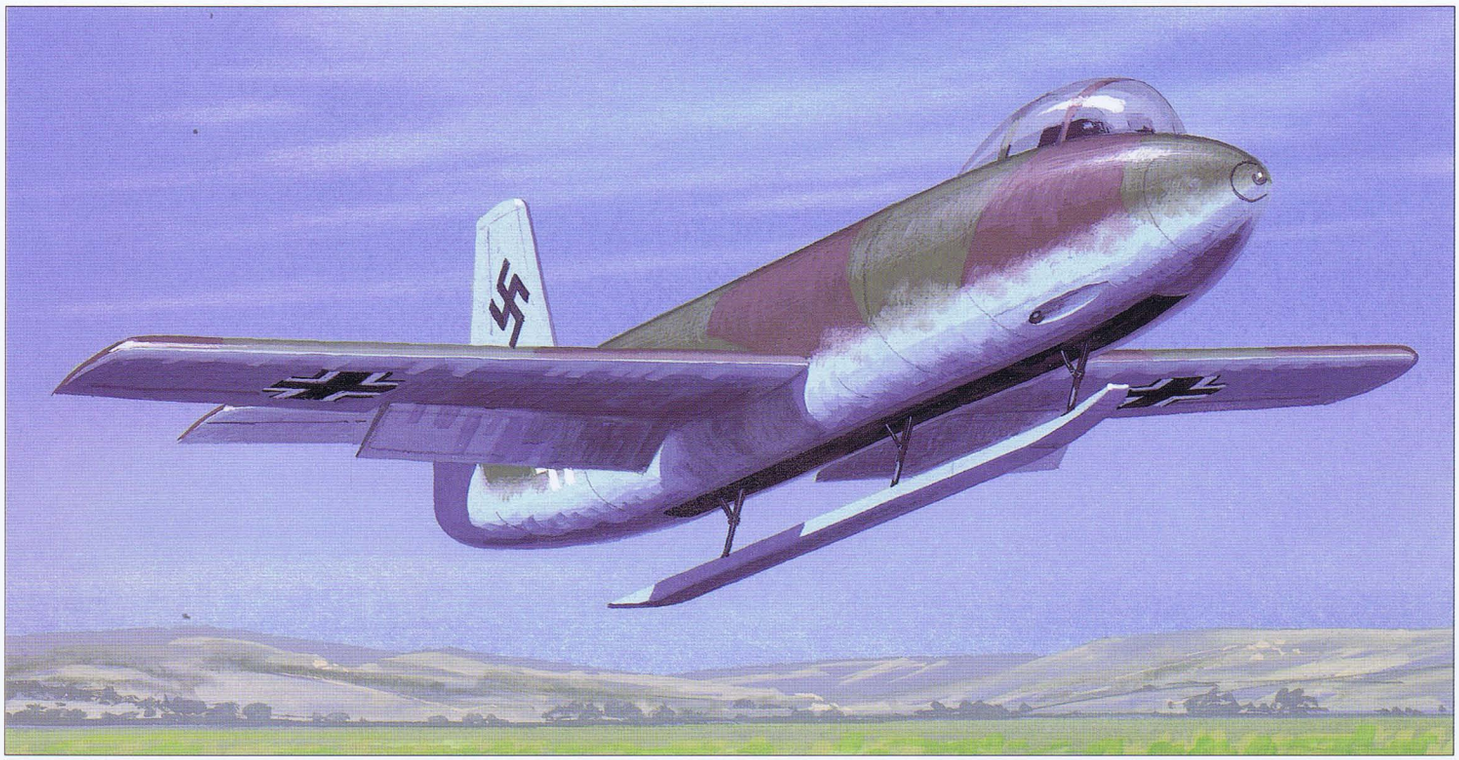
Midget Fighters and Target Defense Aircraft

In 1944, OKL and RLM demanded the manufacture of as many Verschleissjäger (attrition fighters) as possible. On June 19, 1944, Adolf Hitler himself decreed a consolidation of war-production effort: parallel developments were to be avoided with production concentrated on a limited number of fighters or "special attack" aircraft. All project development that was considered either too protracted or expensive was terminated. Other projects of minor interest were allowed to continue only if manpower or production capacity was not diverted from the main effort. Despite all countermeasures, Allied air attacks had, since 1942, badly damaged the German war industry and its vital communication links.

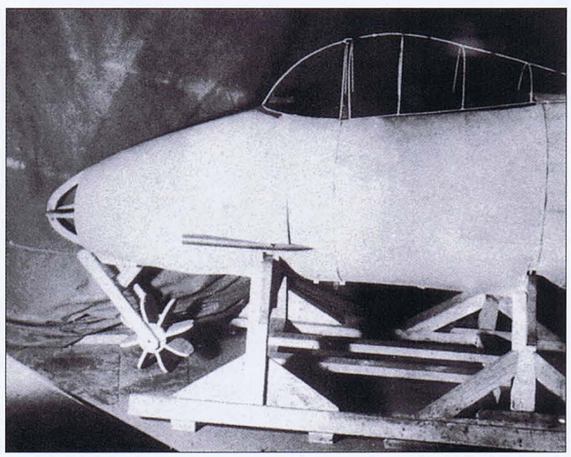
Several projects involving small, but very powerful, midget fighters were investigated. In theory, these small aircraft were either to be towed into battle by single-seat fighters, or carried under the wings or the fuselage of long-range bombers. The idea behind these designs was to provide fighter protection for long-range missions that were beyond the normal range of escorting fighters. Composite aircraft, code-named Mistel (mistletoe), were also evaluated.[25] The mission of the Misteln, however, was quite different in that these composite aircraft were intended for use against heavily defended ground targets.

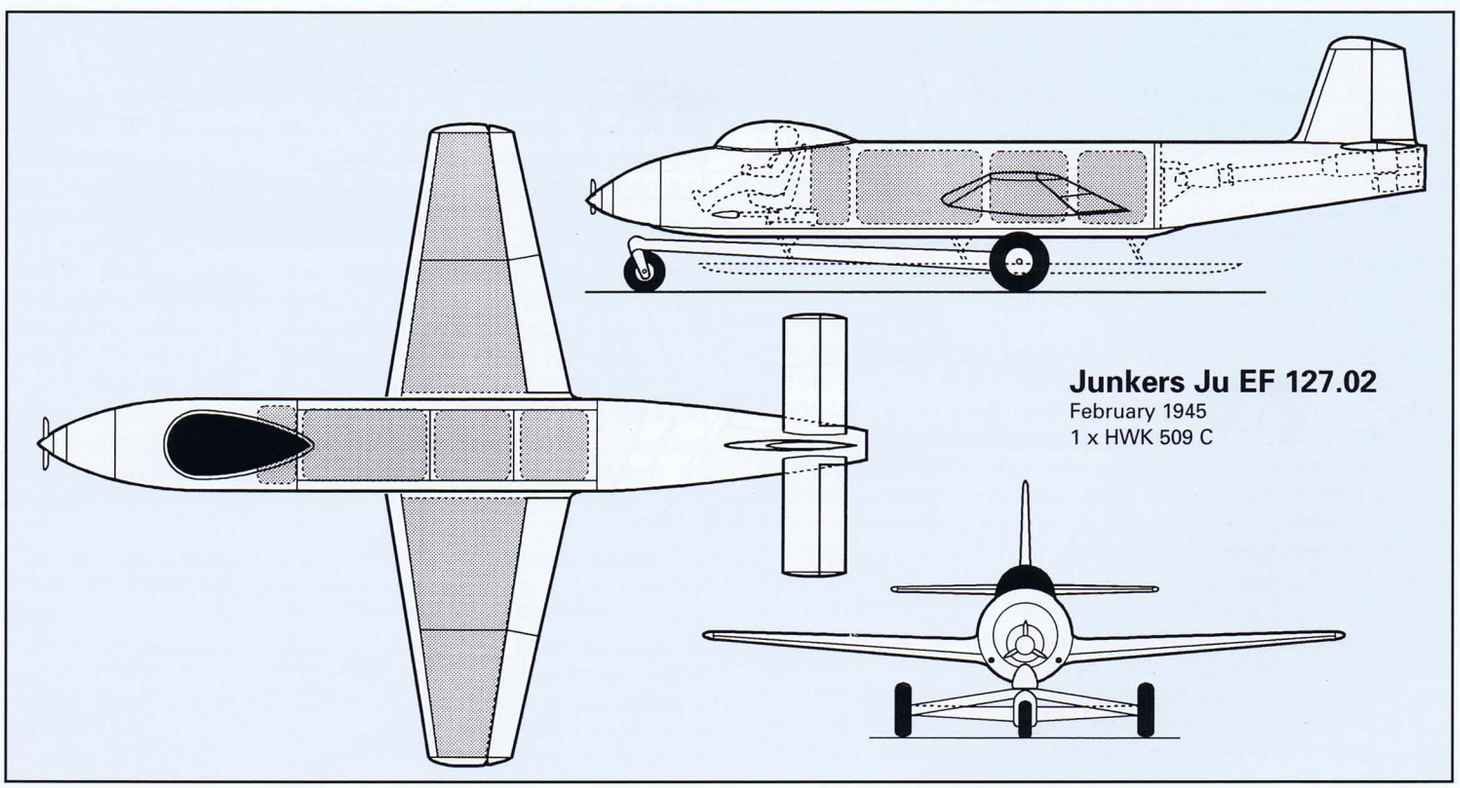
The small Messerschmitt P 1073B Bordjäger (on-board fighter, commonly known as a parasite fighter) was the first turbojet fighter project designed from the outset to be carried in the spacious fuselage bay of a strategic bomber. The small fighter would have possessed folding wings, allowing up to three of these midget fighters to be suspended on rails from the ceiling of the bomber's fuselage bay, having a circular cross-section of 5.5 ft (1.70 m). During the winter of 1939-40, Messerschmitt engineers, anticipated the later Battle of the Atlantic, designed an huge eight-engine, long-range bomber, under designation Me P 1073A, for attacks on enemy convoys off the North American east coast. The true size and scope of this project can be realized when comparing it with the postwar American six-engine Convair B-36 and its eight-jet engine derivative, the Convair B-60. The takeoff weight of the Me P 1073A was calculated at 282,000 lb (128,000 kg), as compared with 278,000 lb (126,100 kg) for the B-36. The German Me P 1073A wings spanned 206.7 ft (63.00 m), identical to the American B-60, and was powered by eight Jumo 223 Diesel engines, each developing 2,200 hp (the early B-36s had 6 x 3,000 hp engines). The giant Messerschmitt's range was estimated at 9,942 miles (16,000 km) compared to 10,000 mi (16,093 km) for the B-36. In order to protect larger long-range aircraft operating so far from their bases, small and fast air- superiority fighters were to be carried on board for defense against attacking enemy fighters. It is worth mentioning that the concept of parasite fighters was resurrected in 1948 with the American McDonnell XF-85 Goblin. The small jet-powered Goblin was designed to be stowed within the B-36 in much the same way as the Me P

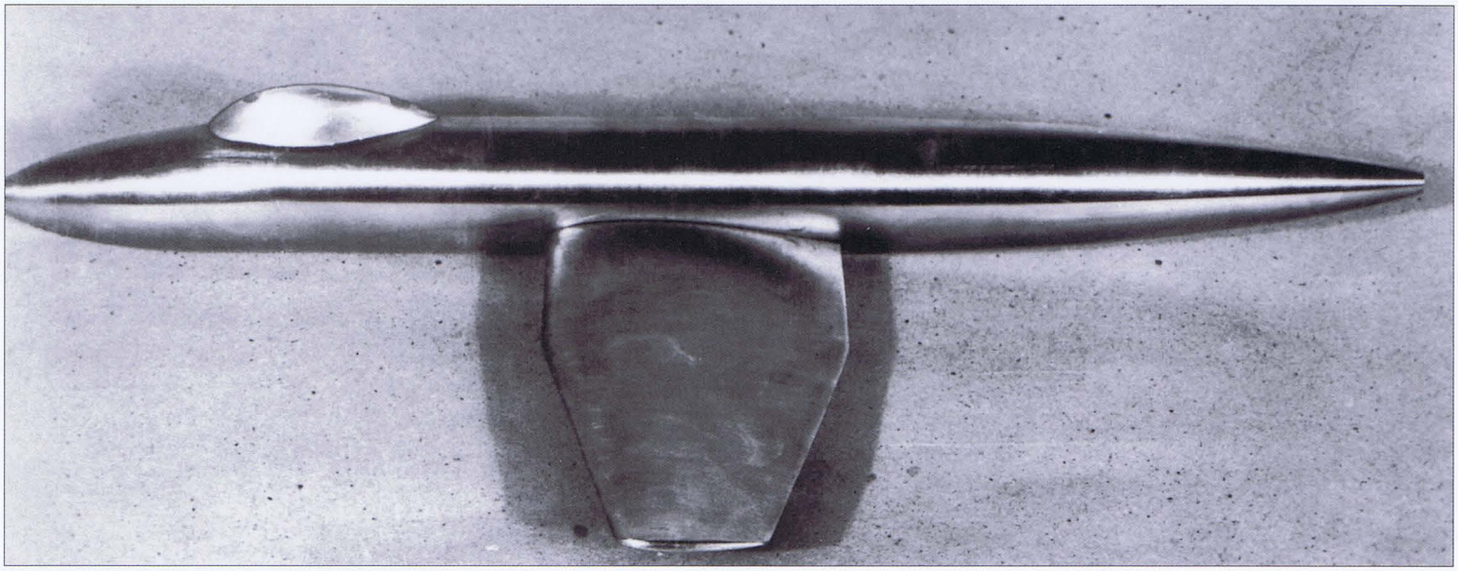
25 The first Misteln were composed of a twin-engined, unmanned lower component, such as a Ju 88 with a smaller single-engined fighter sitting high atop and supported by breakaway braces and struts. The lower aircraft acted as a flying bomb, directed to its target by the pilot in the fighter. At an appropriate distance, the two separated, the lower unit flying into the target, while the manned fighter returned to base.

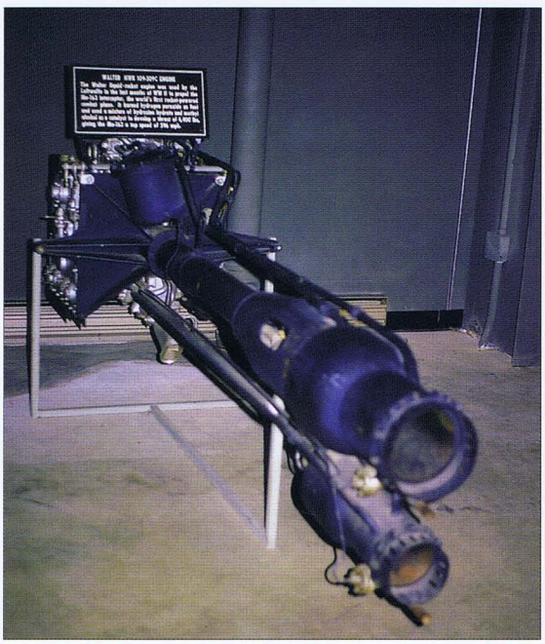


Above: Keith Woodcock's impression of the Ju EF 127.03 shows the aircraft about to touch down on its retractable landing ski. The Ju EF 127 "Walli" was a rocket powered target defense interceptor project that evolved through three different versions. The first design, Ju EF 127.01, (opposite top), was to take off on a jettisonable three-wheel trolley and land on two retractable skids. **Right:** A close-up of the full-size mockup of the enlarged Ju EF 127.03 showing the aircraft with jettisonable non-retractable landing gear . This version, together with the Ju EF 127.02 (shown below) featured a lengthened fuselage designed to accommodate additional rocket fuel. Operational experience with the Me 163 proved that the rocket powered interceptor's effectiveness was severely restricted due to its limited fuel capacity. The Ju EF 127.02 and .03 projects were designed to address this problem. After the war, the Soviets were very interested in "Walli" and its possible application to Russian air defense requirements. However, the Soviets ultimately elected to adapt the Me 263 to their needs. The Russian I-270, built by the MiG design bureau, was the result.

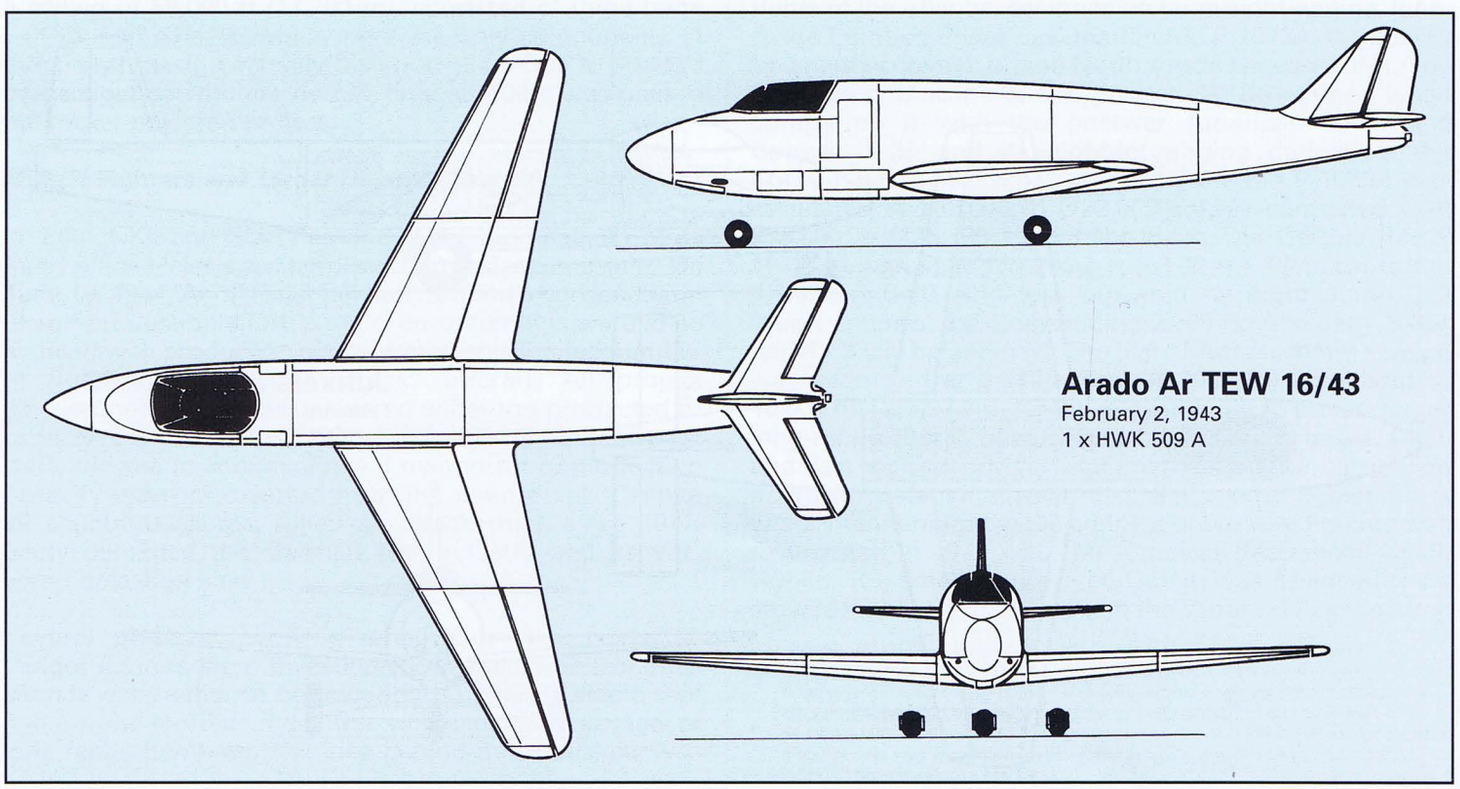








Above: This official Junkers photograph depicts a scale wind tunnel model of the Ju EF 127 in its final form complete with an elongated fuselage and wing. Walli would have presumably enabled the Luftwaffe to more effectively intercept Allied bombers than had previously been possible with the Messerschmitt Komet. With its astonishing rate-of-climb, the rocket propelled interceptor appeared to be the answer. However, its thirsty rocket motor, coupled with limited fuel capacity, meant little time on station before the pilot had no choice but land his empty aircraft as a glider. **Left:** The HWK 509 C-1 was designed to improve the loitering capability of the Komet, by providing the pilot with a secondary cruising combustion chamber positioned immediately below the primary chamber. On test aircraft this system worked well enough to earmark the engine for all new rocket interceptors. However, by the time the new rocket motor entered production, the war was nearing its conclusion. This particular example is the only known surviving example, and is shown on display at the Air Force Museum, Wright-Patterson Air Force Base, Ohio.



Above: The first prototype of the McDonnell XF-85 Goblin, c/n 46-523, parasite fighter developed after the war along parallel lines to the German Me P 1073 B (see p. 26). Both aircraft were designed expressly to be carried within the interior of very large multi-engined long-range bombers (e.g. the B-36 and Me P 1073 A) for the purpose of providing rapid response fighter cover.

1073B was to be carried within the Me P 1073A. The US Goblin lacked landing gear as it was to operate from a retractable trapeze for launch and recovery, but it is unclear how, or if, the Germans planned to recover their midget fighters once launched. Remarkably, the development of the Me P 1073 continued until the summer of 1944, in spite of the fact that the large bomber aircraft had not been approved for construction!

Design drawings for another Bordjäger, the Me P 1104, were completed in Oberammergau during August and September 1944. The diminutive Me P 1104 was another parasite fighter project designed to be carried by the four-engine Me 264 long-range bomber. Development of the P 1104, like that for the P 1073B, was terminated during the last part of 1944 when the German long-range bomber program was canceled.

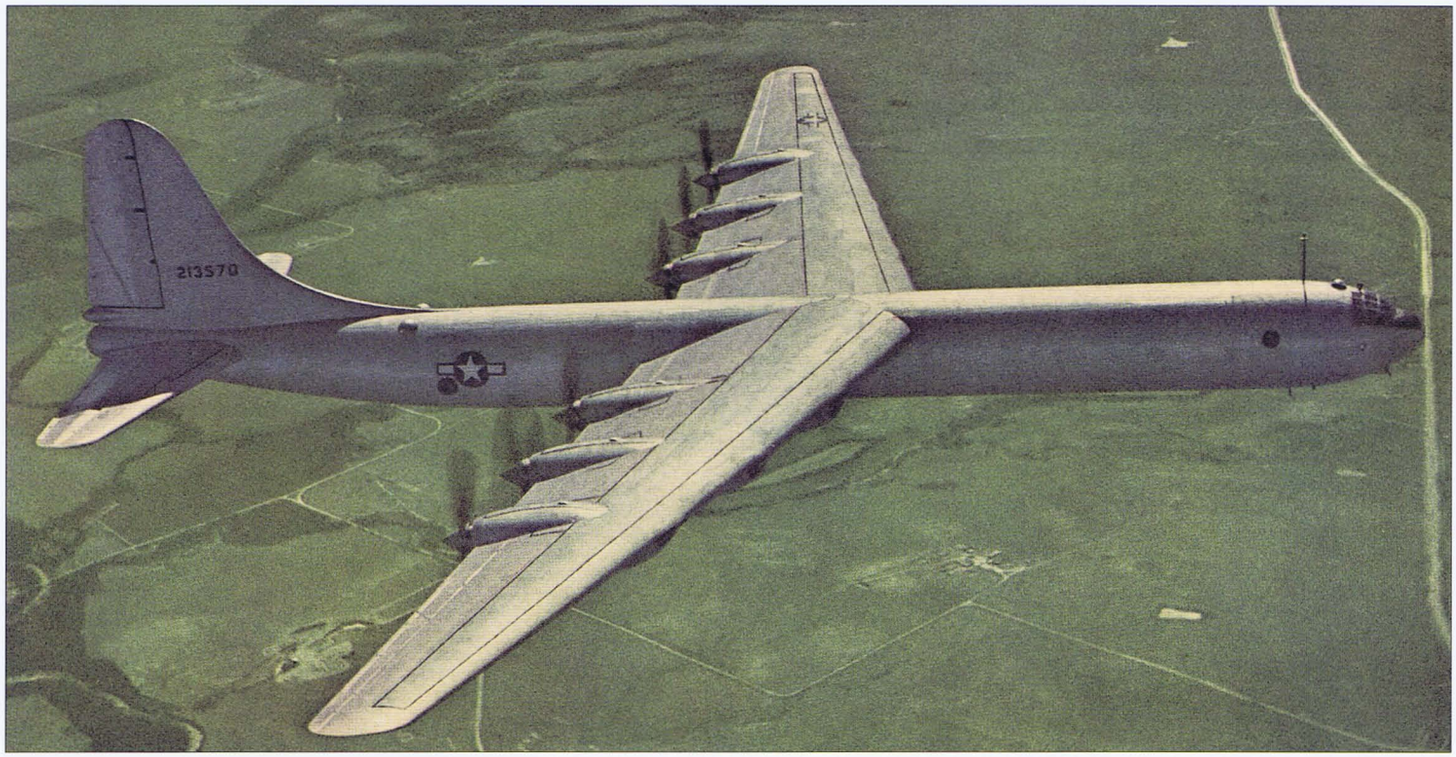
Escort duties aside, the destruction of Allied heavy bombers had the highest priority. Among the first projects promising successful interception of four-engine bombers was the Sombold So 344 Rammschussjäger developed by Ing. Heinz Sombold, a member of the Bley Construction Office at Naumburg on the Saale river. The RLM approved the project and development began in early 1943. It ended with the revised general mission description dated 22 January, 1944.

The wooden midwing So 344 had a takeoff weight of 2,975 lb (1,350 kg) and was powered by a bi-fuel rocket motor, possibly the HWK 509 A-2. As with other midget interceptors, the So 344 would be towed to an altitude of about 19,685 ft (6,000 m), and after release, the rocket motor ignited and the fighter would climb to an altitude about 3,300 ft (1,000 m) above the approaching enemy bomber formation. Diving on the formation in a glide attack, the pilot was to release an SC 500 fragmentation bomb outside of the effective range of enemy fire, and a booster charge would propel the SC 500 into the middle of the bomber formation, where the power of the explosion of about 880 lb (400 kg) of TNT was thought to be sufficient to destroy three or four bombers. During the return flight, in theory the So 344 would have been able to destroy more aircraft, with its machine guns, or the one heavy cannon installed in the armored fuselage.

The Rammschussjäger had a length of only 22.0 ft (7.00 m), and was fitted with a landing skid instead of a conventional undercarriage. The anticipated flight endurance was only twenty-five minutes. After landing, the aircraft could easily be dismantled and transported to the nearest Luftwaffe base for reuse.

During the summer of 1944, the first project descriptions of the Verschleissflugzeuge were sent to Berlin. Several other designers had, in their individual ways, tried to develope inexpensive midget fighters apart from Dipl.-Ing. Erich Bachem's Natter, and Ing. Wilhelm Benz's Romeo and Julia projects from Heinkel. These little wooden craft, armed with powerful MK 108 cannon, were to mount massive attacks on Allied bomber formations. The return to base would be made in a glide, or alternatively, the pilot would simply bail out from his midget fighter and land by parachute.

The most advanced German designs in this category were the He P 1077/I and P 1077/II Julia. The first proposals were made by Ing. Wilhelm Benz in cooperation with Dr. Gerloff, working at Vienna-Schwechat. Later, on June 16, 1944, the He P 1077, a small high-wing monoplane, length of 22.8 ft (6.96 m), was code-named Julia. The tips of the short-span, broad-chord wing had anhedral, similar to that found on the company's He 162. To become airborne, the He P 1077 took off with the assistance of four solid-fuel rockets offering a thrust of 2,645 lb (1,200 kg) each for ten seconds. A retractable skid was provided for landing. The aircraft was armed with two MK 108 cannon and was powered by an HWK 509 C-1 liquid fuel rocket motor with primary and cruising combustion chambers having separate throttles. The pilot lay prone in the nose. First tests with a prone pilot



Above: The Convair XB-36, c/n 42-13570, first flown on August 8, 1946, was the world's largest bomber. The German Me P 1073 A, would have been slightly smaller, but powered by eight Jumo 223 Diesels with a span of 206 ft (63 m) against the 230 ft (70 m) for the six-engined B-36.

were made by Flugtechnische Fachgruppe (Aerodynamic Research Group - FFG) at Stuttgart Technical University with their FS 17 low-wing unpowered glider. From April 10, 1943, tests were also carried out using the Berlin B 9 (Be 341) twin-engine research lightplane.

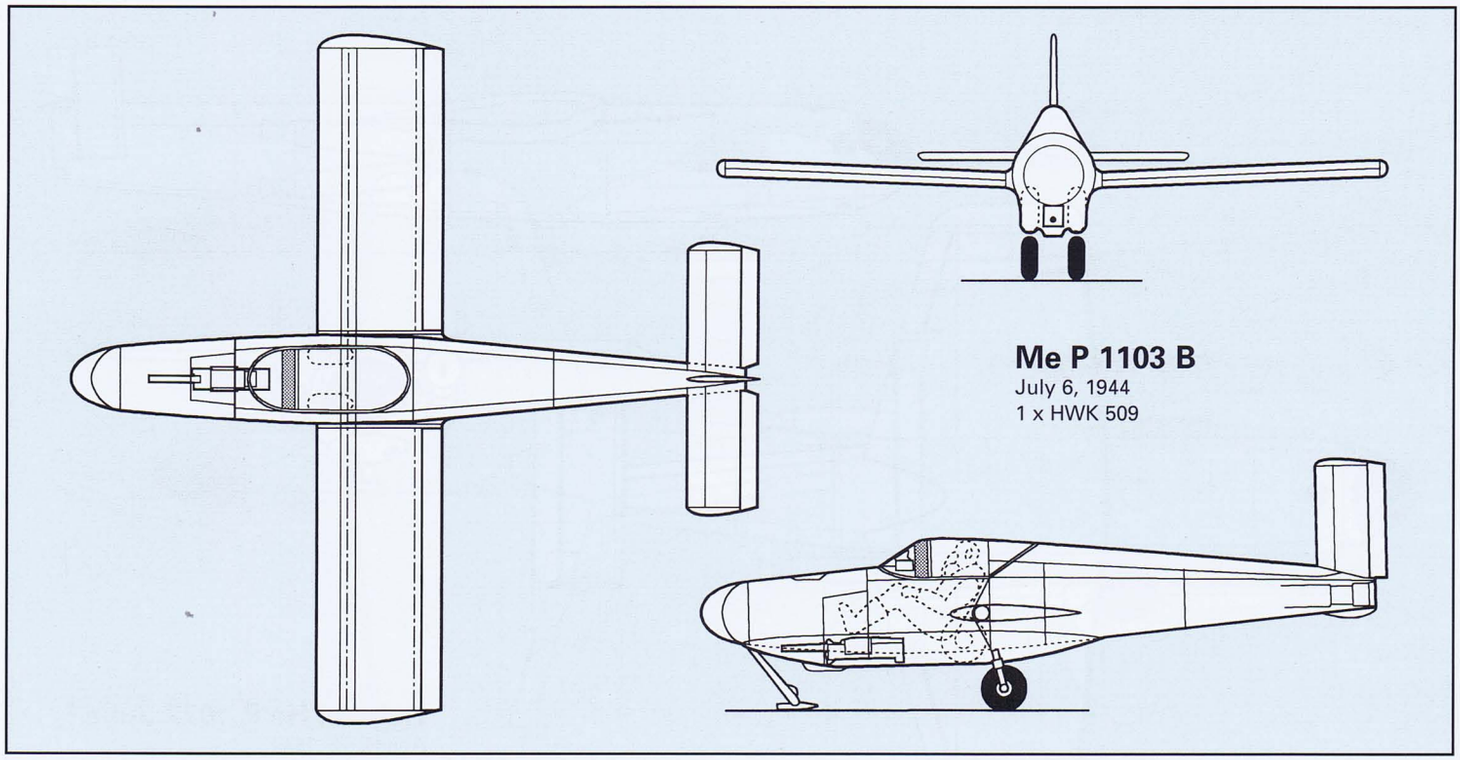
On September 8, 1944, Jägerstab and Chef TLR authorized construction to continue, ordering a limited batch of twenty aircraft to be built by Wiener Holzwerke (Vienna Woodworking Company), where skilled labor was available. At the end of September 1944, the project was again redesignated, probably in an effort to mask the true nature of the project in order to prevent it from being canceled — it was now referred to as the HJ-Segelflugzeug (Hitler Youth sailplane). It was planned to manufacture 300 He P 1077s per month. Project studies were completed on October 15, 1944, and submitted to Berlin.

In addition to the armed fighter, an unarmed glider was proposed. This training version was to be towed to altitude to practice landing procedures. The next variant had rocket propulsion and was referred to as Nullserie (pre-production, or A-0 series). It was to be armed with two MG 151/20s in blisters under the wings. The He P 1077 Julia 101 with two MK 108s (40 rpg) on each side of the fuselage was the next model. It was followed by the He P 1077/II with the pilot in an upright position. After involved discussions about the attributes of the various Julia configurations, and a 1/20th scale flying wooden model was built in October 1944, to verify performance calculations. Because development progressed very slowly, Dipl.-Ing. Jost was appointed project coordinator and development engineer. Later that month, an 1/8th scale model, alternatively fitted with a central fin or twin fins, was tested by the Vienna Technische Hochschule, and in November 1944, another model carried out vertical takeoff tests. Altogether, about forty 1/8th-scale models were built and tested, some of them taking off with the help of small solid-fuel rockets. In the meantime, the Wiener Holzwerke had been the target of Allied bombers, and most of the finished parts and their documentation were destroyed.

In November 1944, a full-scale mockup and four experimental aircraft were ordered. Heinkel and other manufacturers were invited to participate in the project, but all attempts to finish the design failed. Allied air attacks prevented Heinkel from completing the first Julia before the end of the war. In an effort to save the program, the NSFK together with some small woodworking shops were entrusted with construction of the Julia. The first wing was completed on December 19, 1944, and by February 1945, only a few more components had been assembled. The Entwicklungs-Hauptkommission (EHK) then instructed Heinkel's director, Herr Franke, to halt further work on Julia, the project continued nevertheless. The official order from the Chef TLR to stop further development of this inexpensive interceptor project had never arrived at Neuhaus in Tyrol, Austria. At this time, Heinkel received permission to complete two glider test aircraft (He P 1077 M1 and M2), and two rocket-powered test fighters (He P 1077 M3 and M4). By late February, 1945, it was hoped to finish the vertical takeoff tests with 1/8th-scale glider models within a matter of weeks. During this period, a reliable vertical takeoff mode was also under review. Days later, Kommando der Erprobungsstellen (KDE) halted further research in the field of vertical takeoff.

Wilhelm Benz later confirmed that at least five experimental aircraft had been completed before March 1945, and three of them had been launched. When Soviet forces later occupied the main development site at Neuhaus on the Triesting river, all the documentation, scale models and wooden mockups were seized and transported back to the Soviet Union. The Western Allies first obtained the full details of the Julia project when they captured some of the Heinkel design staff, who subsequently compiled data files for the Allies.

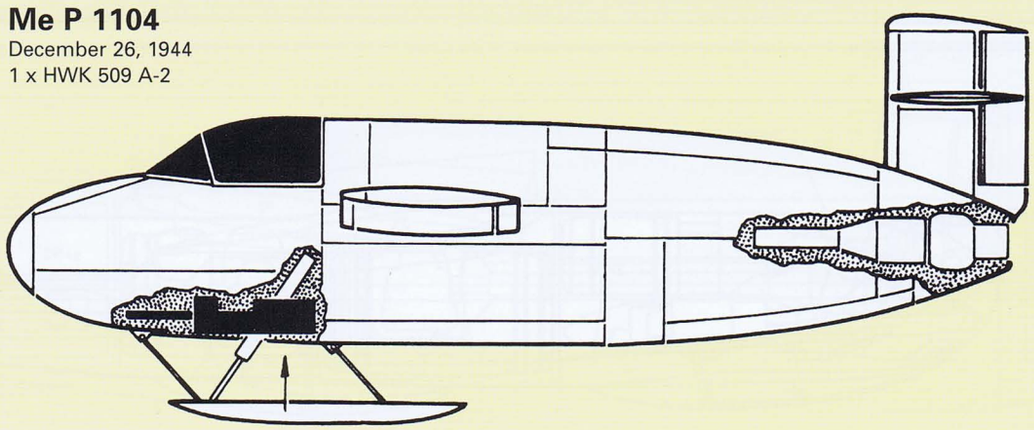
Along with the various Heinkel projects and the Blohm & Voss BV P 213, it was the Arado Ar E 381 Kleinstjäger (miniature fighter) which reached an advanced development

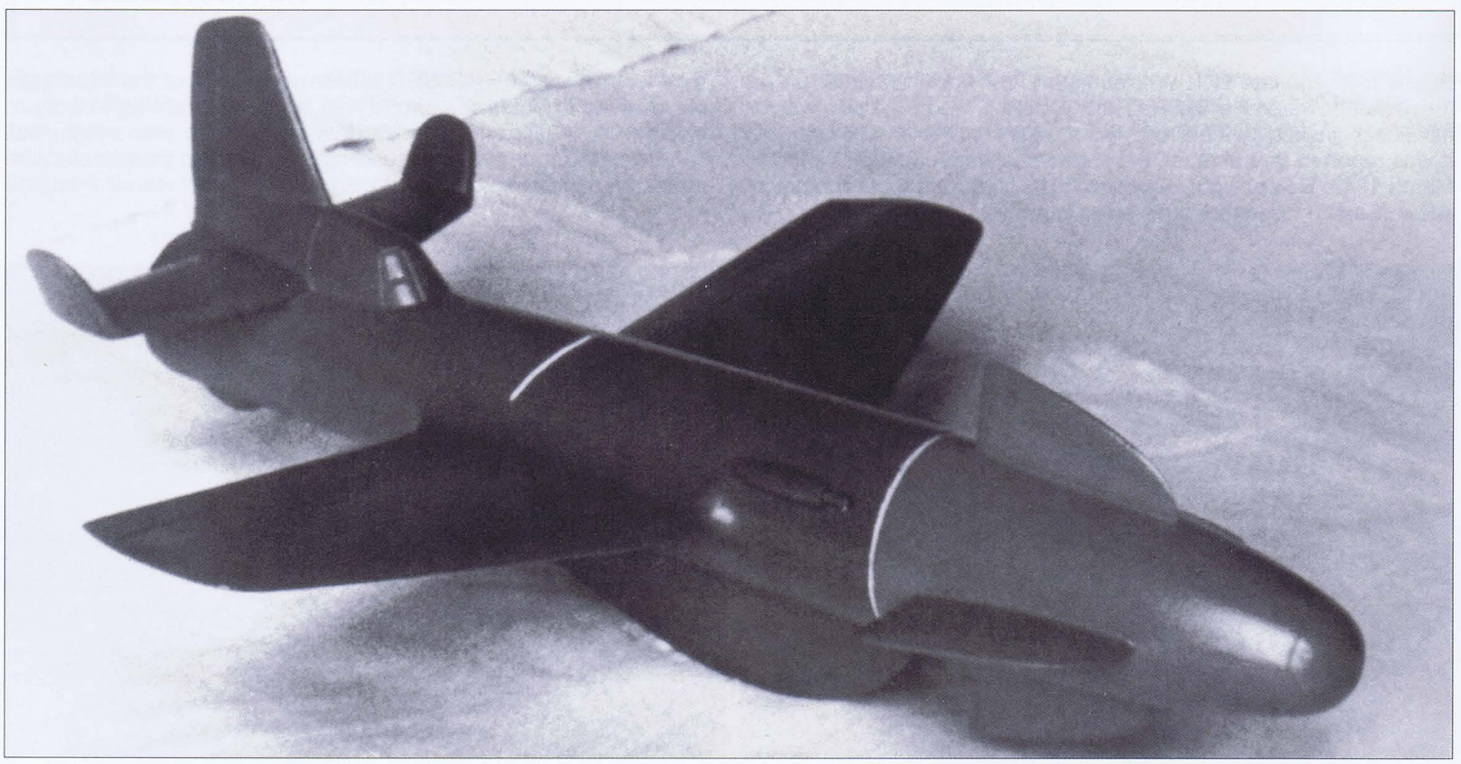


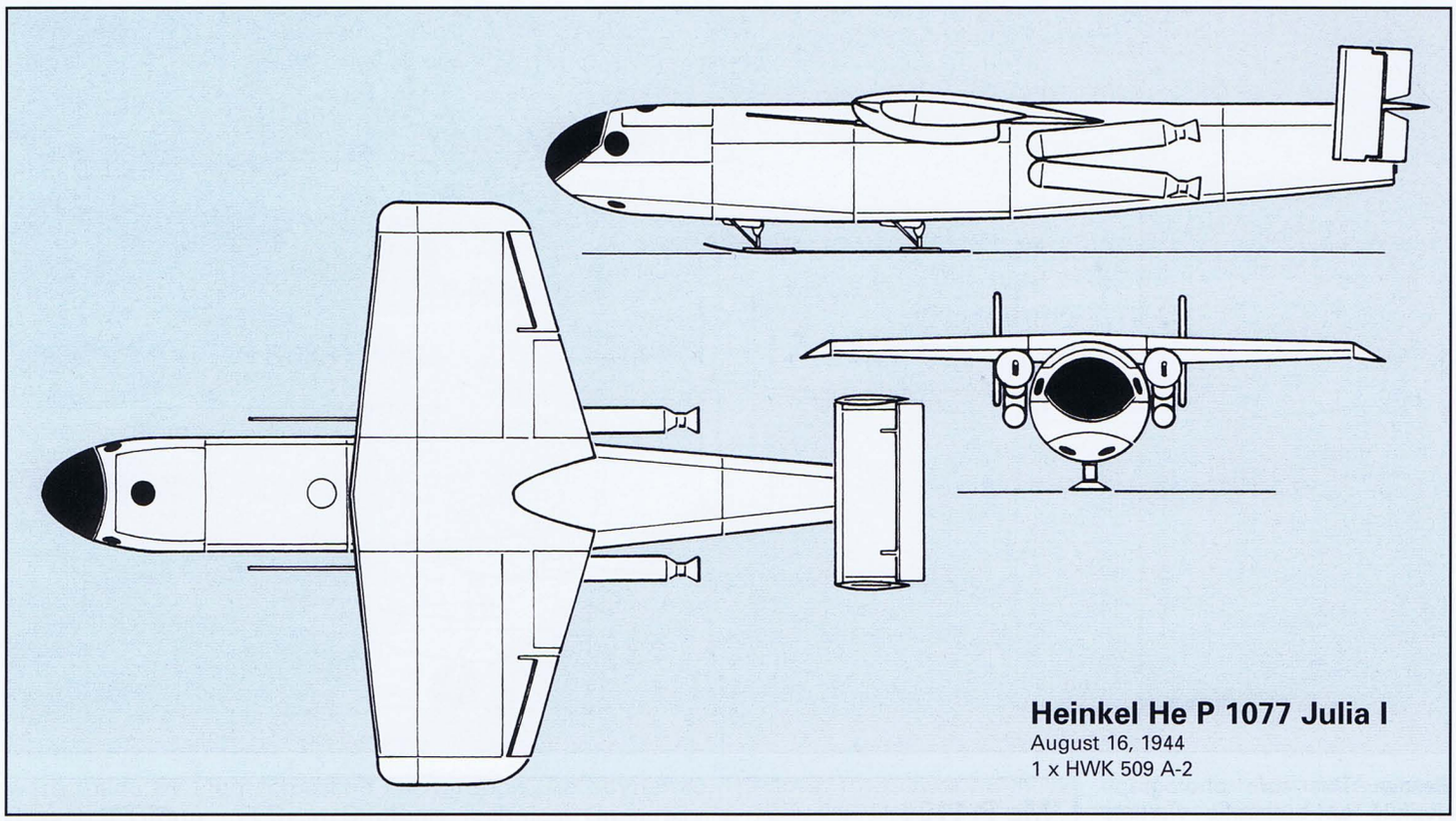
Me P 1103 B
July 6, 1944
1 x HWK 509

Below: This rare photograph depicts an authentic wartime scale wind tunnel model of the rocket powered Sombold So 344. The forward portion of the nose section (shown in a lighter color) would have contained an SC 500 high explosive bomb with four stabilizing fins and fitted with a solid fuel booster rocket for attacking enemy bombers from a safe distance. The project was reviewed by RLM officials in 1944, but ultimately rejected. The RLM GL/C number 344 was later re-assigned to the Ruhrstahl X4 air-to-air missile (see p 189).

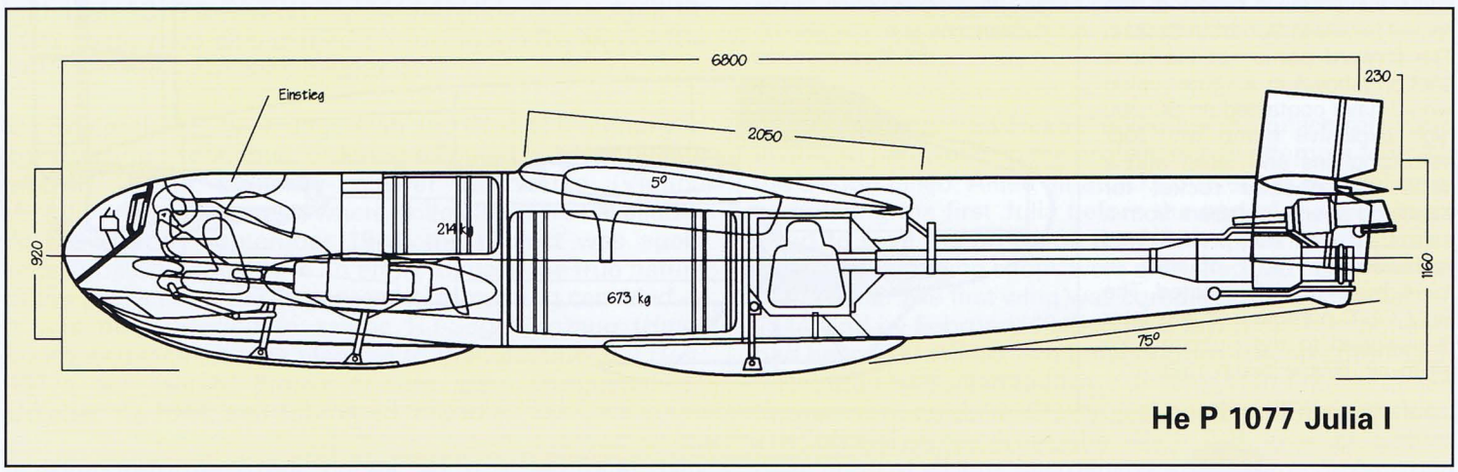
Me P 1104
December 26, 1944
1 x HWK 509 A-2





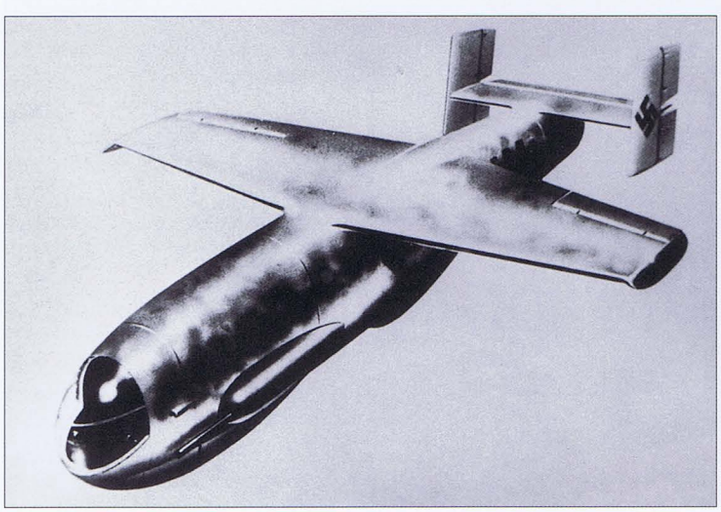


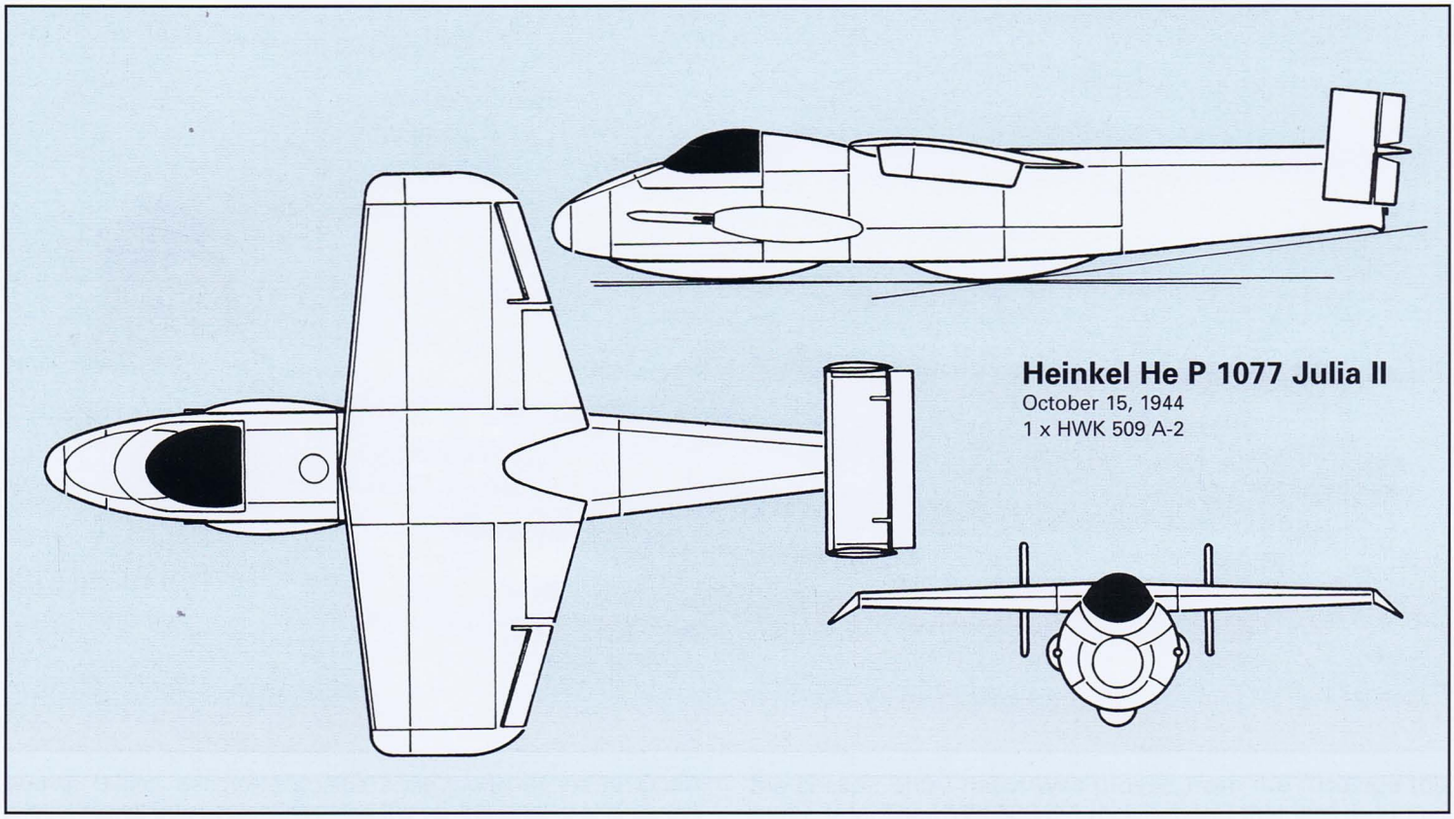
Heinkel He P 1077 Julia I
August 16, 1944
1 x HWK 509 A-2

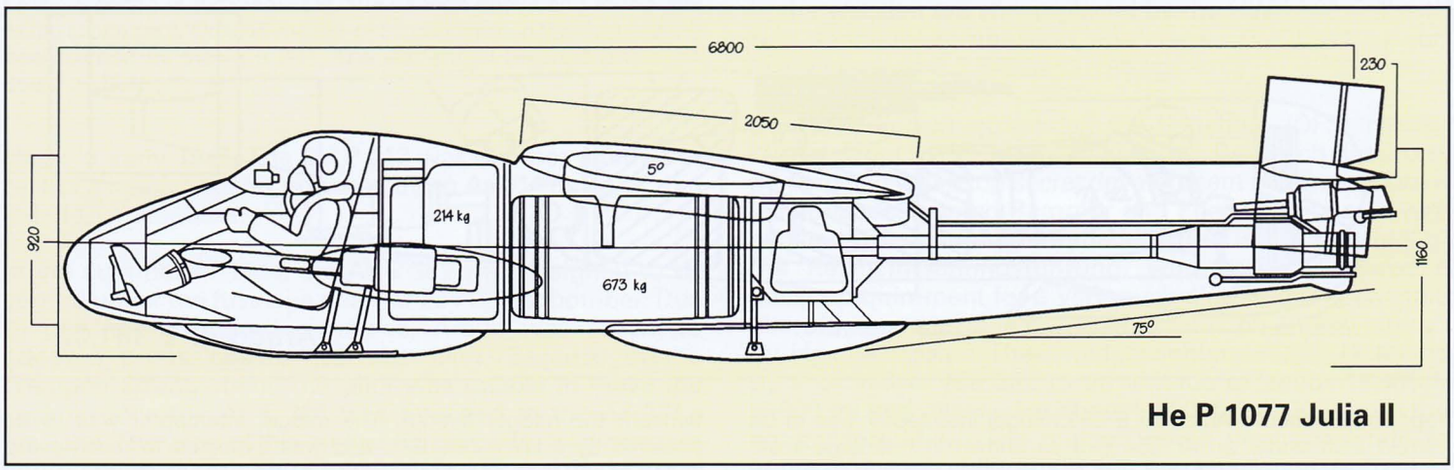


He P 1077 Julia I

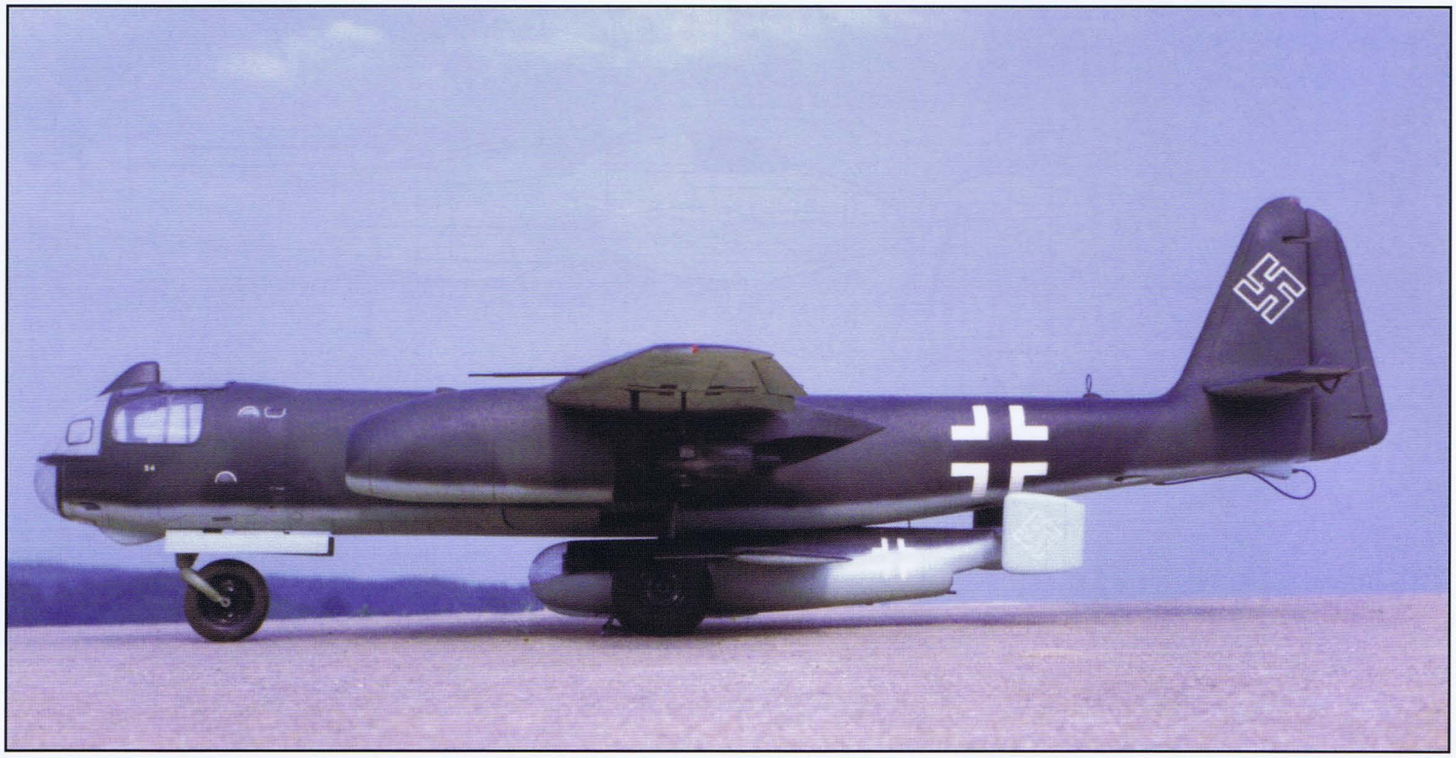
Below left: The late Gert W. Heumann's convincing impression of the rocket powered Heinkel He P 1077, Julia I. The prone pilot would have been flanked by the aircraft's armament of two MK 108 cannon. It was reported that at least five prototypes were completed before March 1945. **Below right:** A posed 1945 photograph purporting to show Austrian workers, from a small woodworking shop, involved in the manufacture of He P 1077 subassemblies. All of the individuals are dressed in outer coats, one with his hat on, posing in front of clean work stations. During the last year of the war, such small woodworking shops were increasingly brought into the manufacture of aircraft components.

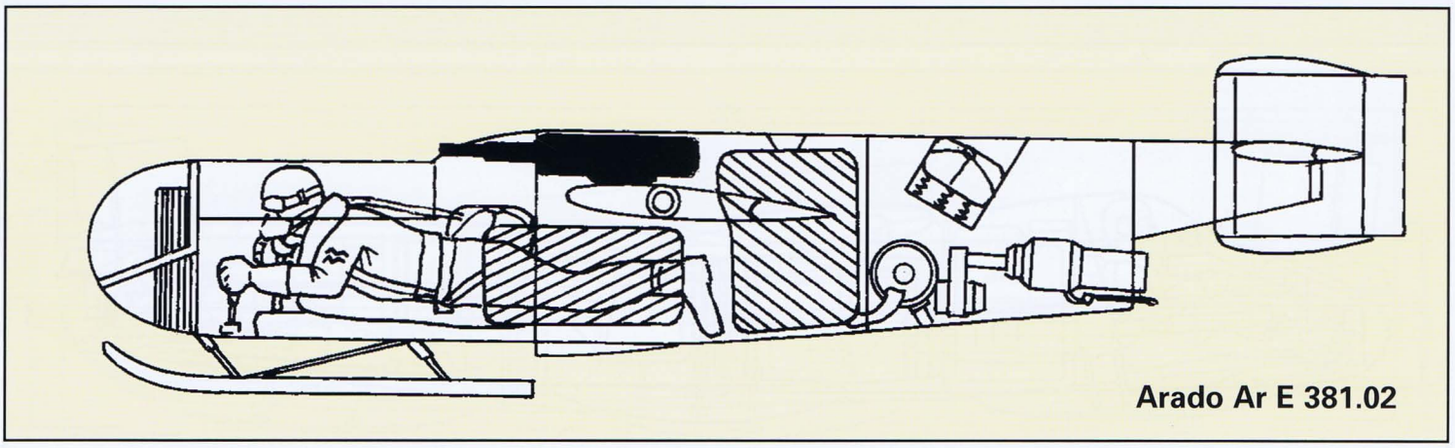




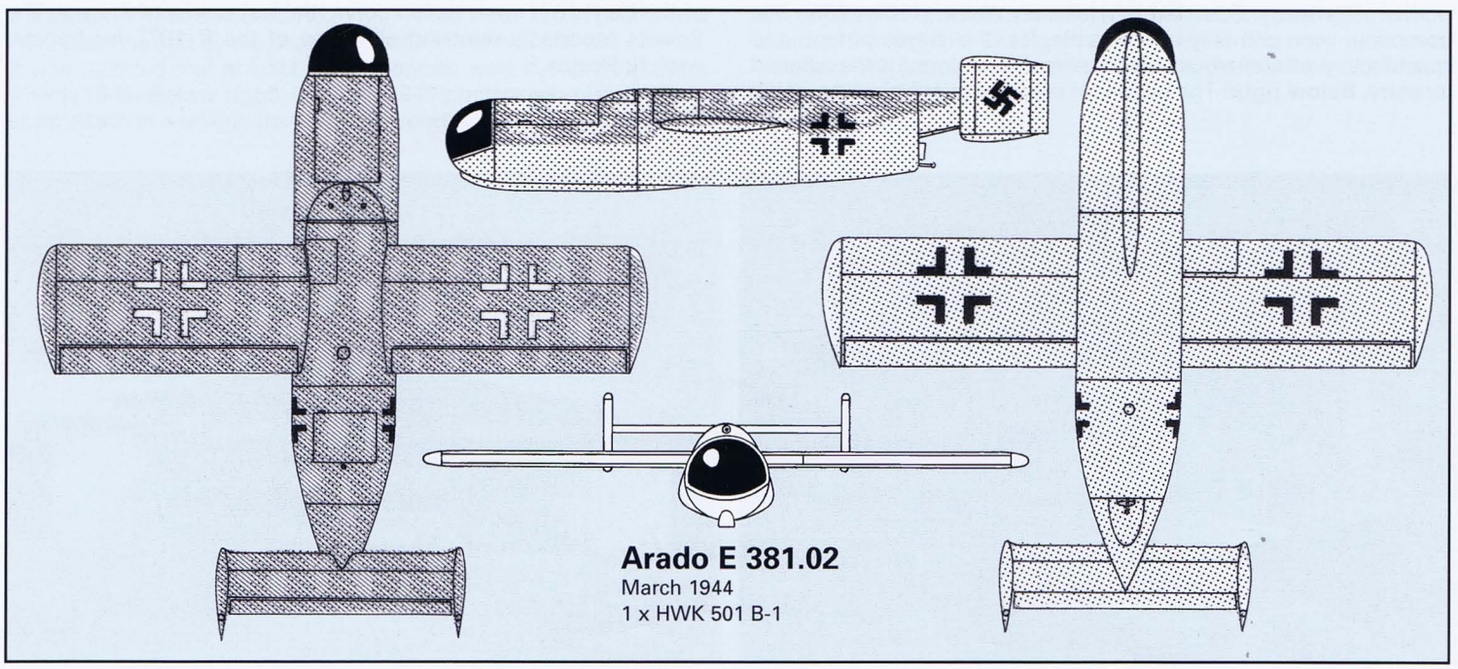


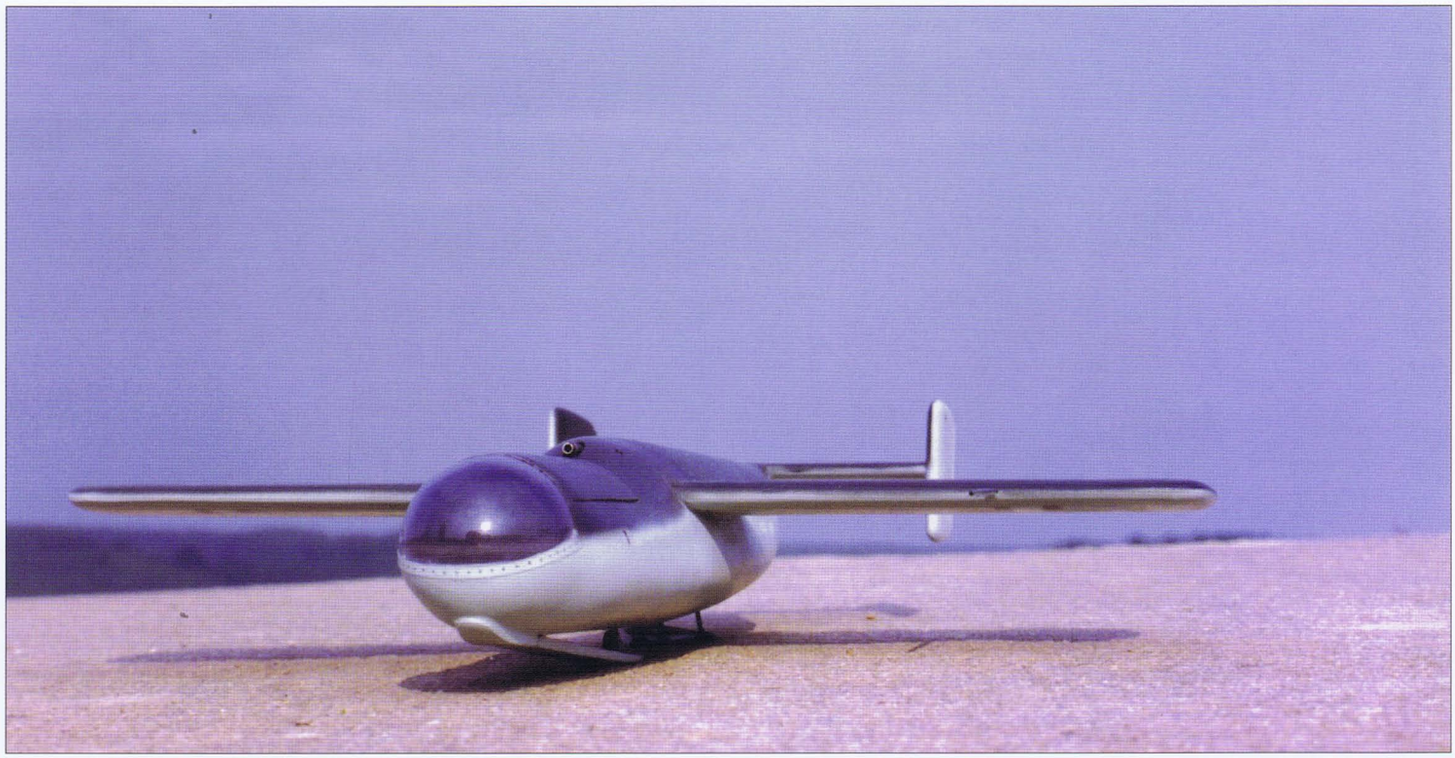
Below left: An overall view of the Hellmuth Walter firm at Kiel in northern Germany. Founded by Hellmuth Walter (1900-1980), this company was primarily responsible for the development and manufacture of numerous liquid fuel rocket motors for the aviation industry. **Below right:** The hangar of the Österreichischen Aeroclub of Spitzerberg at Hainburg near Vienna, where the first prototypes of the He P 1077 were tested during the last weeks of the war. The Soviets reportedly removed all traces of the P 1077 for transfer back to Russia.





Top: The diminutive Arado Ar E 381 midget interceptor was to be carried aloft under an Ar 234 C-3 as shown in this large-scale model. Of principal concern was the marginal ground clearance beneath the midget aircraft. The midget interceptor was to be powered by a HWK 509 B-1, and was expected to reach a top speed of 560 mph (900 km/h) during its high-speed attack.





Above: Günter Sengfelder's large scale model of the Ar E 381 midget rocket interceptor illustrates the central landing skid as well as the location of the single MK 108 cannon above and to the rear of the prone pilot. Only 45 rounds of 30 mm ammunition would have been carried by the Ar E 381. The war ended before a prototype could be built.

stage in early 1945. The BV P 213 was another attempt to realize a midget fighter powered by an As 014 pulsejet, that failed to materialize.

In the summer of 1944, the Ar E 381 was designed to be carried under the fuselage of an Ar 234 C-3 jet bomber. Due to insufficient ground clearance, Arado was forced to adopt a prone position for the pilot. Because of the cramped arrangement, the pilot was unable to leave the cockpit once the Ar E 381 was attached to the Ar 234's fuselage. The wing of this midget fighter possessed constant chord and thickness and rounded wing tips.

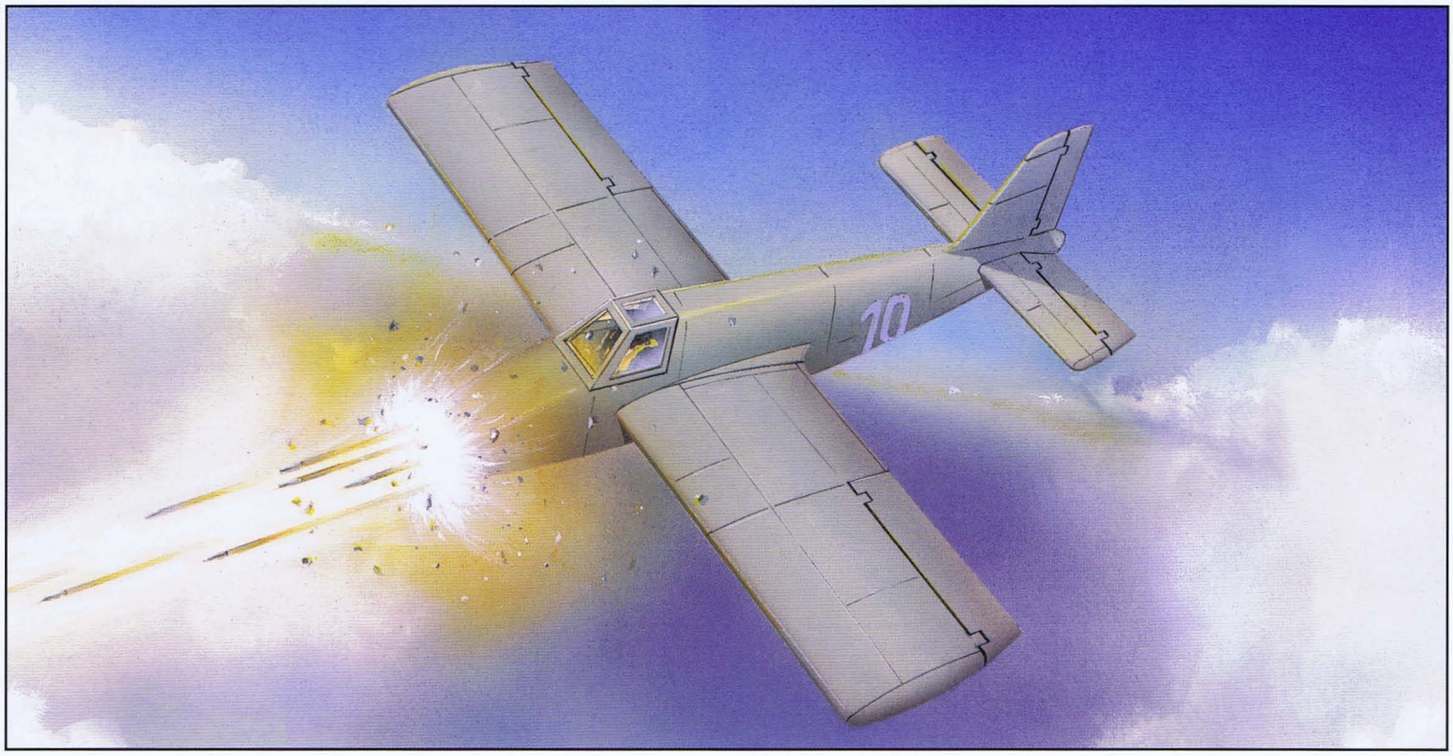
There was no space in the narrow fuselage for the standard armament of two MK 108s, six RZ 73 Rauchzylinder (smoke cylinder), but rather an improved air-to-air rocket developed from the earlier RZ 65 was to be carried, and two MG 131s installed in the fuselage were thought to be feasible. In 1945, this armament proposal was canceled in favor of a single MK 108 mounted behind the pilot's cockpit and containing forty-five rounds of ammunition.

After climbing to 19,685 ft (6,000 m), within eight minutes or less, the carrier Ar 234 would release the midget fighter. The Ar E 381's pilot then dove toward his target igniting the HWK 509 B-1 rocket motor, and accelerated to a speed of about 560 mph (900 km/h). After a high-speed approach to its target, the attack would be made at close range, ensuring a higher degree of success. Having completed his mission, the pilot had to either land the aircraft on its fuselage-mounted skid, or bail out if the aircraft had been damaged by enemy fire; although the heavily armored and small size of the Ar E 381 would have made it a difficult target.

The first Ar E 381 design proposals had shortcomings, that required a complete redesign of the fuselage. In particular, the cockpit entry hatch was moved from the fuselage top to the side. The HWK 509 B-1 rocket motor that was mounted in the wooden tail was replaced by the HWK 509 C-1 with two separate combustion chambers. The total takeoff weight was only 2,545 lb. (1,200 kg).

Deutsche Forschungsanstalt für Segelflug (DFS) named "Ernst Udet", the German Gliding Research Institute, participated in the top-secret development and two different versions, designated Rammer and Eber (wild boar), were evolved. The studies were made by request of the chief of the Reichsforschungsführung, who urgently issued a design requirement for a Verbrauchsflugzeug (expendable aircraft), that was able to fly two attacks on enemy aircraft during one mission. These midget fighters were to be towed by a Bf 109 or Me 262 to an altitude of about 19,685 ft (6,000 m) and released at about 6,500 ft (2,000 m) from the enemy formation. The midget would then accelerate to about 560 mph (900 km/h) for the attack. An estimated force of about 100 G's would be reached during acceleration and it was believed that a maximum of 16 G's a pilot could endure without serious effects, rendering the midget fighter incapable of continued flight and safe return to base. The Rammer project was therefore abandoned and replaced by Eber, which was to be armed with an R4M battery of 28 missiles in the fuselage nose. The wings of the Fi 103 (V-1 Buzz Bomb) as well as major tail assembly sections were adapted. The DFS designed the wooden fuselage in late 1944, with an armored cabin for the protection of the pilot. Instrumentation and equipment were kept to a minimum, although initially an armament of one or two MK 108s had been requested, and 24 R4M missiles were required. Standard armament was later reduced to 14. A number of promising remote-controlled bombs and anti-aircraft missiles were given a higher priority at the time, and the Eber project was terminated in early 1945.

The Flugzeugbau Zeppelin (FZ) company at Friedrichshafen on Lake Constance, began working on the design of the Fliegende Panzerfaust (flying bazooka) in the summer of 1944. The single-seat heavily armored midget interceptor was to be towed into battle by a conventional piston-engine fighter. Power was provided by a bi-fuel HWK 509B



Above: Bob Boyd's impression of the DFS Rammer expendable aircraft code named Eber (wild boar). This project called for the Eber to be towed to altitude, released, ignite the solid-fuel Schmidding 533 rocket, and streak to make a single attack with a battery of fourteen R4M air-to-air rockets contained in the nose. The pilot would then either bail out, or glide down to land.

or C, or by six solid-fuel rockets, and mounted, three on each side on the rear fuselage. The FZ-FP project interceptor was designed to ram the vertical tailplane of an enemy bomber and cause it to loose control and crash. The high forces in the collision probably would have resulted in the injury, or death, of the Fliegende Panzerfaust's pilot. Therefore, development was halted in favor of a well-armed single-seat fighter.

The Messerschmitt research group, also known as the Oberbayerische Forschungsanstalt (Upper Bavarian Research Institute), turned their attention to two small heavily armored fighter design projects. In the early summer of 1944, the Me P 1103 Panzerjäger (armored fighter) and Me P 1104 were proposed. Drawings for these two light-weight fighters, armed with MK 108s, were finalized between August and September 1944. Propulsion was provided by one HWK 509 A-2 with one combustion chamber. The wings and components of the fin and rudder were adapted from the V-1 Buzz Bomb program. The pilot was seated in a narrow cabin which was equipped with only the most basic instruments and equipment. It was recognized that these projects were too late, and by September 1944, further development was terminated. In order to shift all available capacity to the Me 262 and the Me P 1101.

Mixed-propulsion Fighters

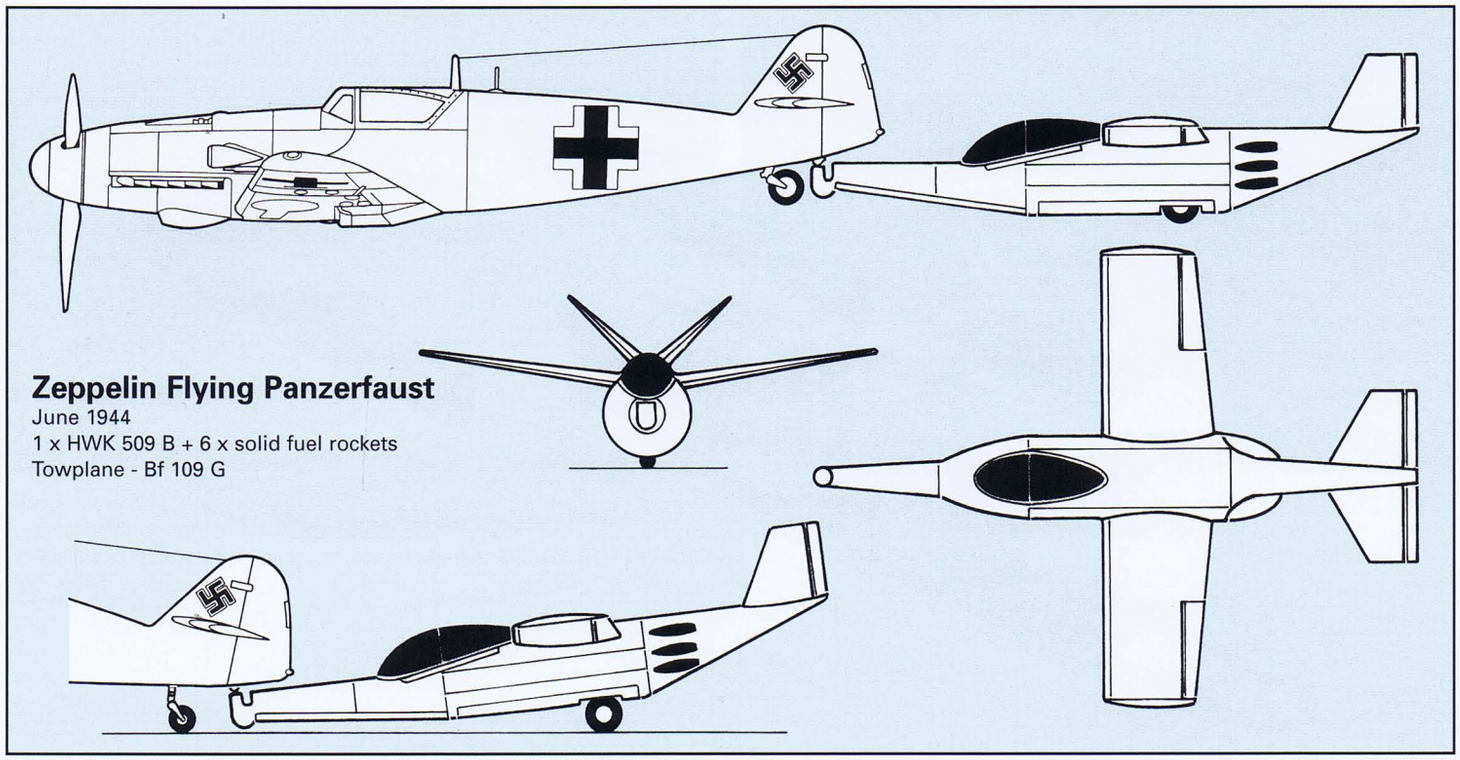
In an effort to combine the extraordinary climb rate of the rocket-propelled fighter with the range of the gas turbine jet fighter, several mixed-propulsion combat aircraft were developed in Germany between 1940 and 1945. Among the most advanced designs was Focke-Wulf's Flitzer, fitted with a rocket motor mounted beneath its turbojet. Known as a einmotoriger TL-Jäger mit R-Gerät (single-engined jet fighter with rocket device), the design was based on the original Flitzer A(see p. 40) powered by an HeS 011, but with an additional Walter bi-fuel rocket motor mounted under the jet pipe. The rate of climb was calculated at 44.3 ft/sec (13.5 m/s), reaching an altitude of 24,600 ft (7,500 m) in approximately 70 seconds under full power from the jet and rocket motor. The top speed was estimated at 516 mph (830 km/h) at 19,685 ft (6,000 m).

In the early development stages, the Flitzer was armed with two MK 108s in each wing, and two MG 151/20s in the front fuselage; an alternative armament of one MK 108 with sixty rounds in the fuselage, and two MG 151/20s (175 rpg) in the wings could be installed. Another version had two MK 103s and two MG 151/15s in the fuselage, and the final design called for four MK 213s (120 rpg).

The Focke-Wulf development team was fully occupied with the HeS 011-powered Flitzer A and the Ta 183 projects; therefore, the mixed-power version was canceled in late 1944. The development of a rocket-powered version of the Ta 183 (Ta 183R) was also stopped a few weeks later.

The single-seat Ju EF 128 TLR-Jagdflugzeug (mixed-propulsion fighter) was a modification of the day fighter project and participated in both of the 1945 competitions. The fact that no mixed-propulsion units were available prevented the success of this project during the closing months of the war.

The development of the He 162 A with the BMW 003R had begun in early 1945. Heinkel's intention was to design a fast target-defense fighter fitted with the mixed-power BMW 003R. A maximum range of about 250 miles (400 km) was expected, and flight endurance was limited to 30 minutes. The necessary tanks required for the mixed-power unit substantially increased the take-off weight of the Heinkel fighter, thus the undercarriage had to be strengthened. There was little hope for a sufficient supply of the mixed-power engines, and little likelihood that the two prototypes would be completed. This project was abandoned in favor of Messerschmitt's more powerful Me 262 Heimatschützer.



Above: The flying bazooka, developed by the Zeppelin company, was another expendable interceptor project designed to be towed to altitude where it would be released for its single ramming pass against an enemy bomber. Its ramming speed was to be reached by six solid fuel rockets. Pilot survivability after such an attack was questionable.

The mixed-power Me P 1106R was canceled in 1945, for much the same reasons stated in the above-mentioned projects, namely range and endurance. Under the leadership of Erwin Leiber, Gotha engineers evolved the Go P 60R, a two-seat flying-wing interceptor and heavy day fighter, a design modification of the P 60A fighter that had one HWK 509A mounted between the two BMW 003s, which could be installed either over or under the large wings. This proposal evolved in early 1945, and was canceled by order of the Chef TLR.

More than one year before the Me P 1106R, work on the Me 262 Interceptor I commenced in September 1944. Initially identified as the Me 262 J-1, however, it was not long before this series designation was amended, becoming the Me 262 C-1a, Heimatschützer I. The initial performance data was compiled by May 26, 1943: an aircraft with a take-off weight of 15,763 lb (7.150 kg) and powered by two Jumo 004C turbojets plus a Walter RII 211/3 rocket located in the jet's rear fuselage, which would be capable of attaining an altitude of 39,370 ft (12,000 m) in 3.2 minutes. Maximum speed was calculated at approximately 590 mph (950 km/h). One month later, on June 22, 1943, a detailed description of an improved model of Interceptor I was compiled by Dipl.-Ing. Althoff. Due to an increase in take-off weight, 4.5 minutes were now needed from take-off to an altitude of 39,370 ft (12,000 m). The maximum range was given as only 342 miles (550 km). The proposed armament was six MK 108s (60 rpg). Between July and December 1944, the performance data of the proposed prototype and production series were calculated.

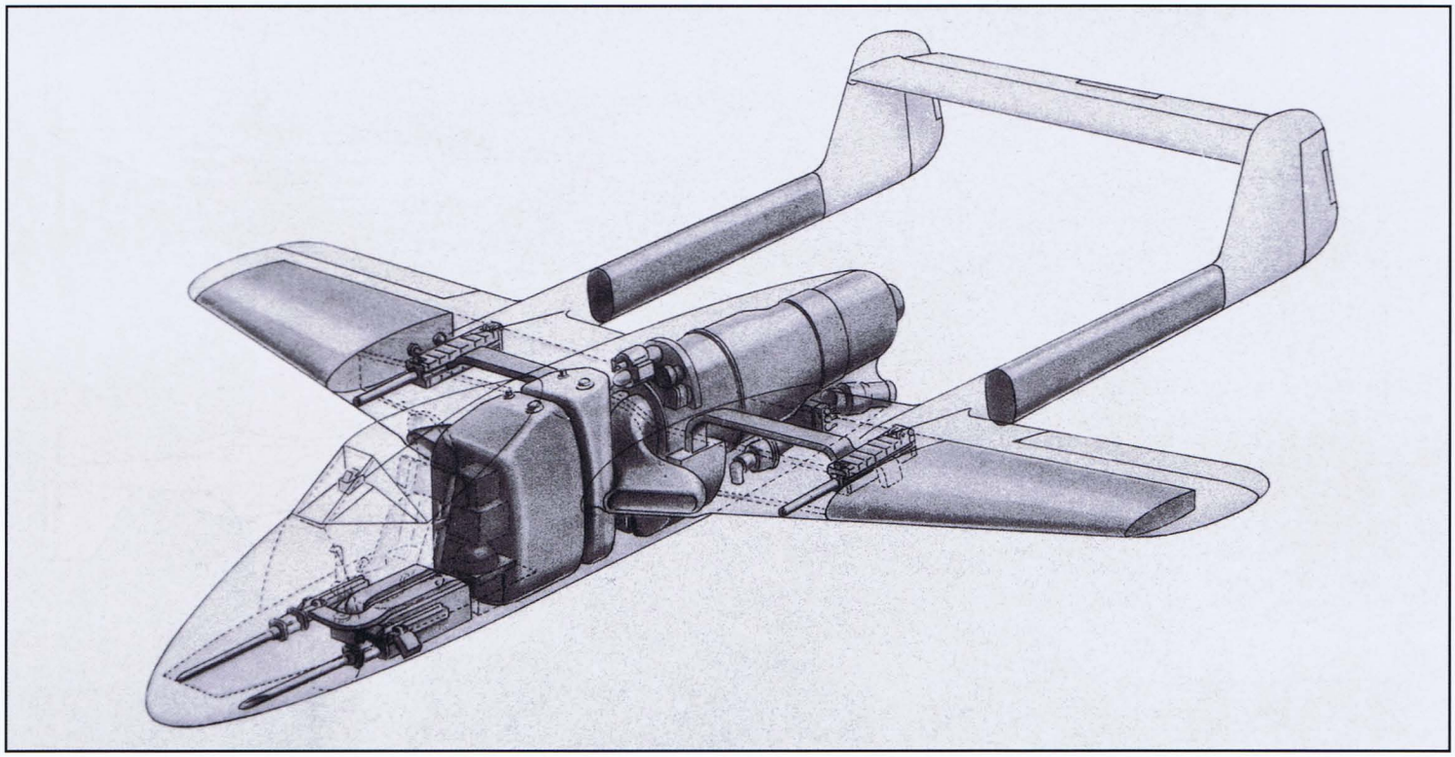
The prototype, the Me 262 V186, W.Nr. 130186, was created by modifying an existing early production standard A-1a series airframe. Flight tests were repeatedly delayed by failures and technical problems within the unreliable rocket motor and the complex fuel delivery system. On February 27, 1945, the sole Heimatschützer I, once again redesignated as the Me 262 V6,[26] flew for the first time. After only three flights with the unreliable rocket motor, the front fuselage was damaged on March 19, 1945. Only three days later, the aircraft was parked at Messerschmitt's facility at Lechfeld, where it was further damaged by an Allied night raid, and on March 31, 1945, further development was terminated. When the airfield was occupied by the Allies, the damaged prototype was shipped to England for further analysis.

The Heimatschützer I rocket motor was in the rear fuselage. In contrast, BMW engineers were working on a mix-power turbojet, with the rocket unit incorporated in the upper nacelles of the turbojets. The first experimental components had been completed in June 1942, and in the summer of 1943, a twin-engined fighter powered by such a mixed system was under development at BMW. In July 1943, two projects with auxiliary propulsion systems were investigated under the preliminary type designations BMW TL-Jäger mit TLR 950 and TL-Jäger mit TLR 1300.

The most advanced proposal had an expected maximum range of about 715 miles (1,150 km). On July 30, 1943, BMW also investigated the possibility of adapting two auxiliary rocket motors of 4,400 lb (2,000 kg) thrust to the Me 262. BMW calculated that a top speed of 547 mph (880 km/h) at an altitude of 26,250 ft (8,000 m) was possible, with an estimated endurance of 46 minutes at the service ceiling of over 32,800 ft (10,000 m). The projected rate of climb was extraordinary — 32,800 ft (10,000) in only 1.5 minutes. The BMW 003R, mixed-power engine was recommended as the prime propulsion unit for this Me 262 Interceptor II. The first description of this interceptor was dated September 4, 1943, identifying the new series as the Me 262 D-1, single-seat fighter with a takeoff weight of 15,653 lb (7,100 kg).

The first complete TLR-engine system set (BMW 003 with a BMW 718) was bench-tested by BMW in March 1944. However, several months elapsed before the system became available in only small numbers in November 1944.

26 The first Me 262 V6, W.Nr. 130001, VI+AA, had been destroyed in a crash on March 9, 1944.



Above: This Focke-Wulf phantom view of the mixed-power variant of the Fw 226 Flitzer project, dating from September 20, 1944, shows location of the weapons, fuel tanks and the HeS 011 R turbojet with auxiliary rocket. Because the two engines required different fuels, a more complicated fuel delivery system had to be designed.

Five months before, on June 6, 1944, the Chef TLR ordered the construction of two experimental prototypes of the redesigned Interceptor II, now termed Heimatschützer II. The initial provisional designation, Me 262 D-1, was dropped with development continued under the series designation Me 262 C-2b.[27] On December 20, 1944, the first experimental airframe Me 262 V074, W.Nr. 170074, was delivered to Lechfeld, but a number of technical failures delayed the first flight until March 29, 1945, and a second test flight followed three days later. At this time, the second experimental aircraft, Me 262 A-1a, W.Nr.170272, became available. The first prototype, without its engines, was captured at Lechfeld at the end of April 1945. The Me 262 C-2b never reached production.

The projected Heimatschützer III, formerly the Interceptor III, would have dispensed with jet engines in favor of two HWK 509A rockets, but did not get the go-ahead. Another rocket-boosted variant was proposed as the Me 262 C-3 Heimatschützer IV. This was an Me 262 conversion without extensive modification: a Walter HWK 509 S-2 was fitted in a large blister fairing under the Me 262's fuselage. The idea was advanced early in January 1945, and the conversion of a standard Me 262 A-1a was begun on February 1, 1945. It was ordered finished during February 1945. Concurrently, an experimental rig was to be made at Oberammergau in order to verify the precise dimensions as well as proper functioning of the conversion set. Messerschmitt also made two special jettisonable fuel tanks of 159 US gallons (600 liters). When the war ended, a few miscellaneous parts of the incomplete first experimental aircraft were found at Oberammergau by American troops.

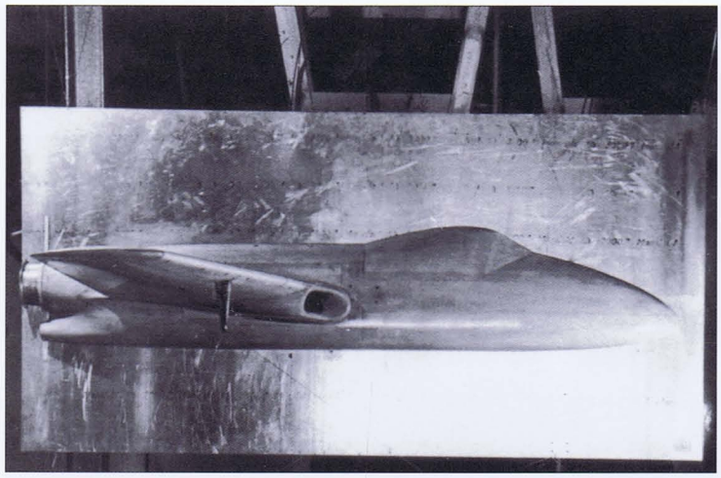
Vertical Takeoff and Rotating Wing Fighter Aircraft

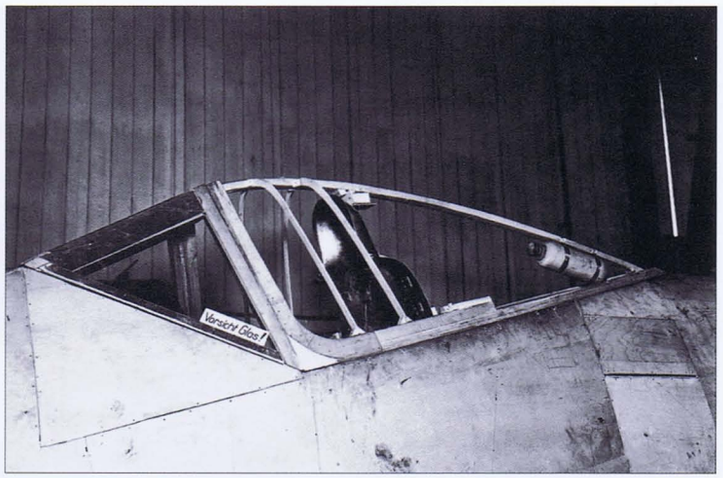
In common with most agencies of the German government, the RLM needed time to evaluate the relative merits of new aircraft fighter technology. Its main energies were focused on conventional piston-engine fighters powered by the DB 603 or Jumo 213 engines. In 1944, as the war entered its fifth year, the nonavailability of superior aero engines of increased performance and the ever-worsening general situation forced the Technische Amt, OKL, the Chef TLR and the Jägerstab to search for new and revolutionary ideas concerning modern propulsion systems and aircraft design.

One of the main targets of the Allied bomber offensive was the Luftwaffe's ground organization, in particular the airbases of the Reichsverteidigung (defense of the Reich forces), which were so important for the defense of Germany proper. In order to prevent further exhaustion of the Luftwaffe's operational strength due to destroyed or damaged airbases, it was proposed to prepare mobile platforms all over the country from which rocket-propelled target-defense fighters could be launched from vertically positioned ramps. These launching sites could be quickly moved as the need dictated. Plans to launch small, well-armed, single-seat interceptors from wooden or metal rails or ramps were also worked out. The easily dismantled launch frames could be hidden, rendering them difficult targets.

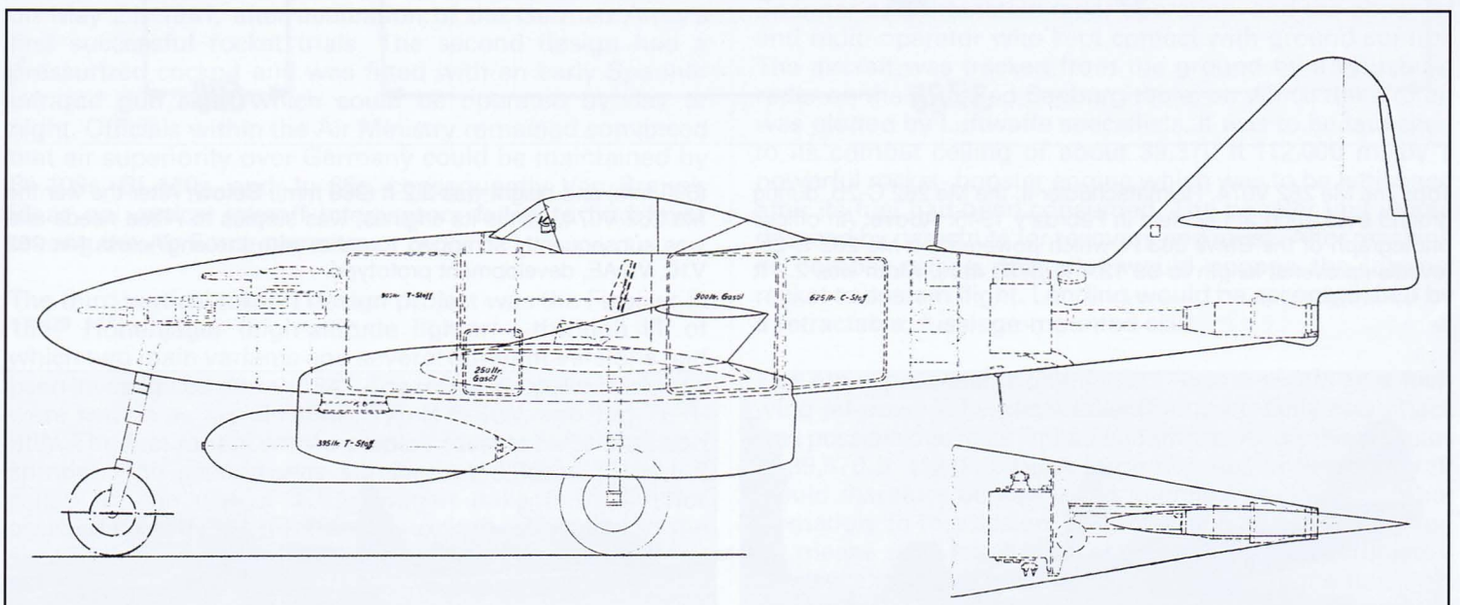
One of the first rocket-powered interceptor projects was devised by the famous rocket pioneer, Wernher von Braun. He designed three different fighters at the Heresversuchsanstalt – HVA (Army Experimental Facility located at Peenemünde). Designated Stratosphären-Jäger (Stratosphere Fighters) I through III, he submitted these proposals to the RLM on July 6, 1939. The world's first vertical takeoff interceptor, identified as a leistungsfähiges Jagdflugzeug mit Strahlantrieb (high-performance fighter with jet propulsion), or Rückstossjäger (reaction fighter), was an early example of von Braun's foresight. The rocket motor functioned on nitric acid and Diesel oil. The warplane was nothing more than a manned missile which could be launched from mobile ramps carried on trucks to the launching site. Stationary launching sites, consisting of large hangars for the assembly and launch preparation of

27 The lowercase "b" denoted an engine change to the BMW 003.

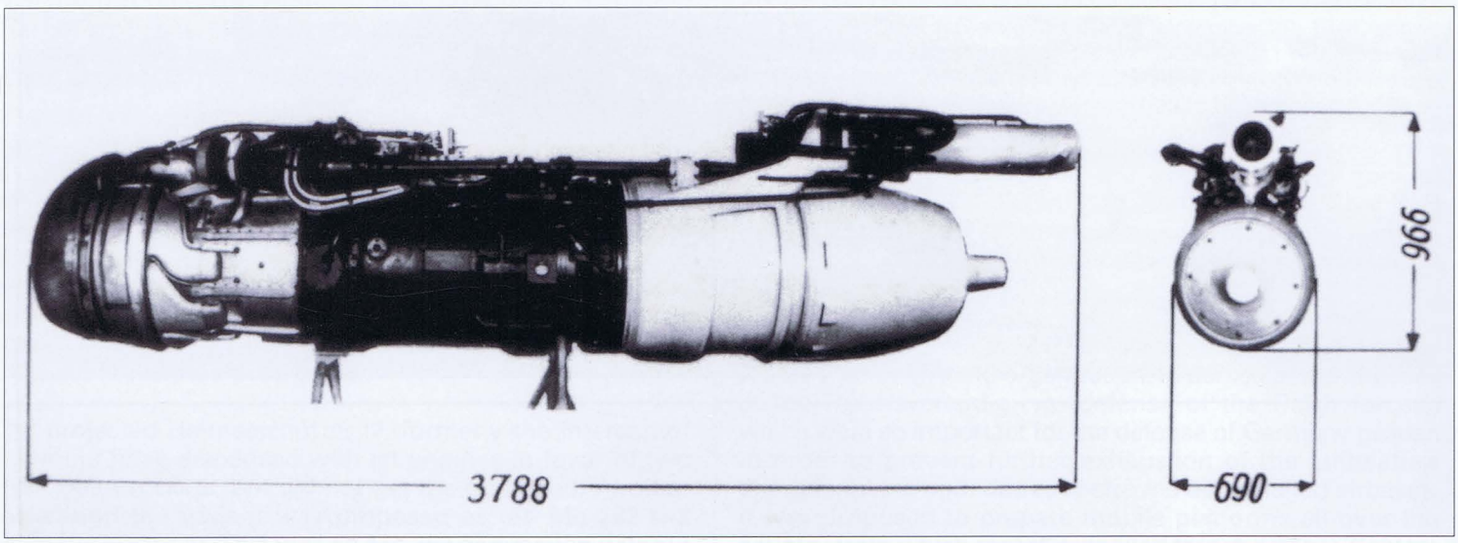




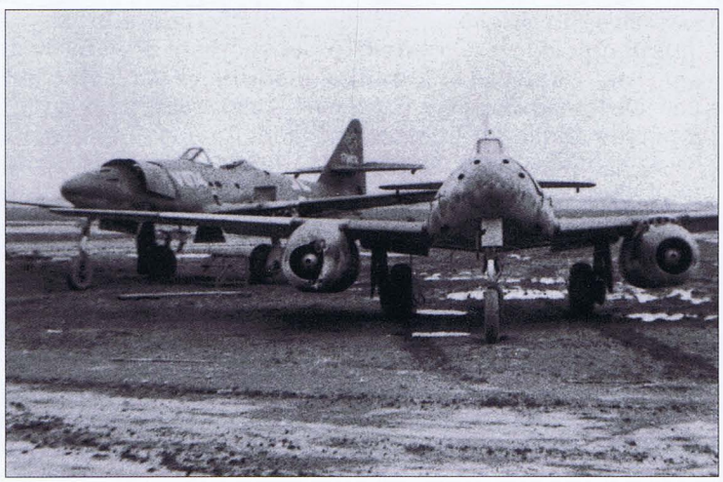
Above: A wind tunnel model of the mixed-power Flitzer. **Above right:** A detailed wooden mockup of Flitzer's cockpit showing the pilot's armor and emergency canopy jettison cylinder. **Below:** The Me 262 V186, prototype for the Heimatschützer I, the Me 262 C-1a, during its takeoff run at Lechfeld, near Landsberg in Bavaria.



Factory drawing II/169, dated July 22, 1943, shows the ME 262 Interzeptor I with two Jumo 004s and a tail-mounted HWK RII rocket motor (HWK 509 A-2). The external fuel tank contained 104 gal (395 ltr) of T-Stoff rocket fuel while the forward fuselage fuel tank contain 238 gal (900 ltr) of T-Stoff. The aft fuel tank was to hold 165 gal (625 ltr) of C-Stoff rocket fuel. Two additional internal fuel tanks held 303 gal (1150 ltr) of J-2 jet fuel. Armament was to consist of six MK 108 cannon.



Top: The Me 262 V074, Heimatschützer II, the Me 262 C-2b, during ground evaluation at Lechfeld in February 1945. **Above:** An official photograph of the BMW 003 R, which powered the Me 262 C-2b, reveals its overall length to be 12.4 ft (3788 mm), width was 2.3 ft (690 mm) and height was 3.2 ft (966 mm). **Below:** After the war the Me 262 V074, minus its engines, was surplus to Allied needs and was subsequently scrapped together with the engineless Me 262 V10, VI+AE, development prototype.



Above: The Me 262 V074, W.Nr. 170074, demonstrates its two rocket motors during this static test in February 1945. Besides the deafening racket from the rockets, the airframe's painted rear surfaces' were scorched by the intense heat.

the Rückstossjäger, were also envisioned. The fighters were to be launched at short intervals and guided by Würzburg radar to their targets — enemy bomber formations. The first model had a spacious, fully glazed cabin within a bullet-shaped fuselage and was armed with four machine guns located in the wing roots.

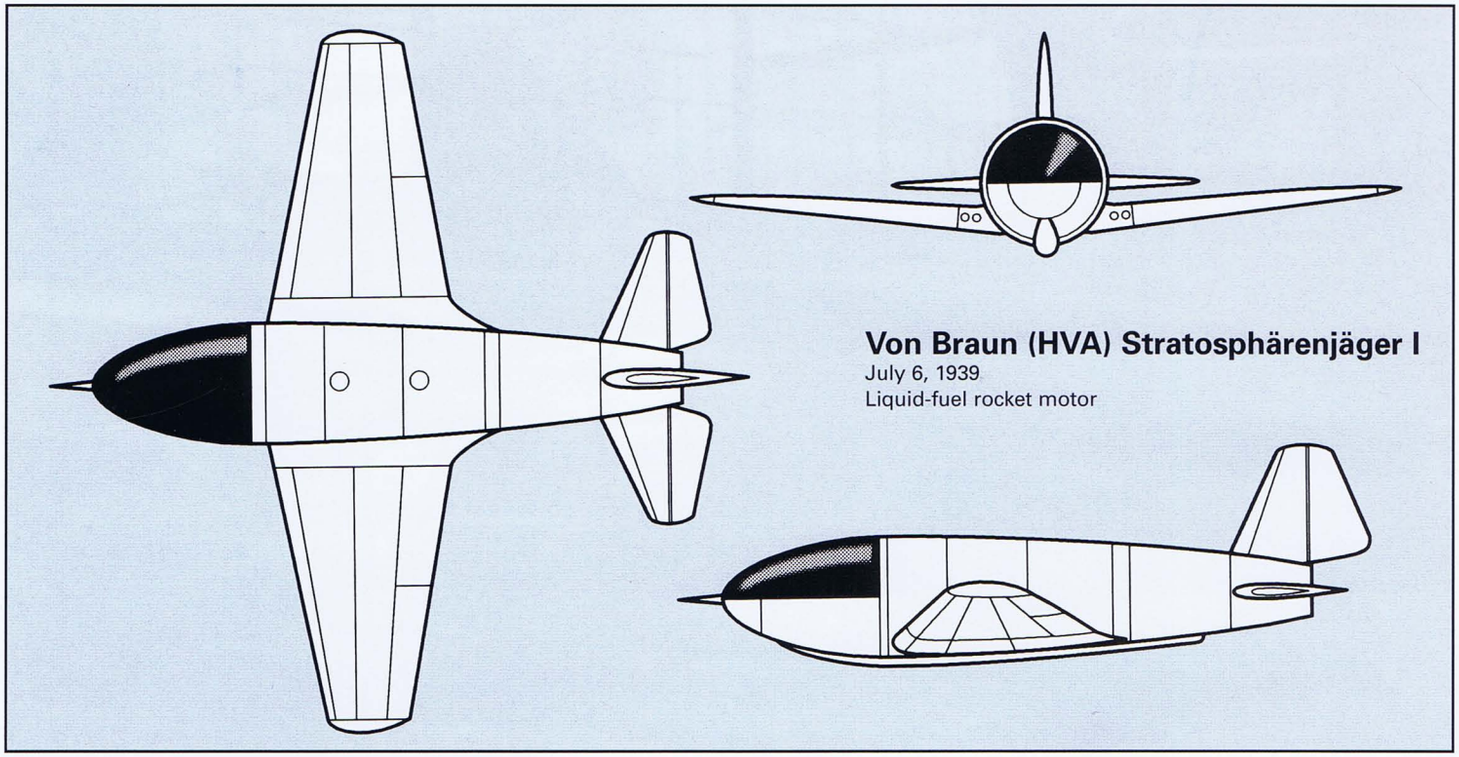
Because the RLM showed very little interest in the above-mentioned concept, von Braun advanced a second proposal on May 21, 1941, after evaluation of the German Army's first successful rocket trials. The second design had a pressurized cockpit and was fitted with an early Spanner infrared gun sight which could be operated by day or night. Officials within the Air Ministry remained convinced that air superiority over Germany could be maintained by Bf 109s, Bf 110s, and Ju 88s, consequently Von Braun's ideas on vertical takeoff interceptors failed to find favor among the Air Force planners.

The third vertical takeoff design project was the Fieseler Fi 166[28] Höhenjäger (high-altitude fighter) I through III, of which two main variants and several different versions had been investigated during 1941. The rocket-propelled versions were known as Typ R-R-RuR, Typ R-R-StW, and Typ TL-R-StW. The first model was to employ rockets for takeoff and combat. The second was similar but differed in that it called for the use of a Startwagen (takeoff trolley) for assisted takeoff. The third design model was similar to the second but anticipated the use of two wing-mounted turbojets. A preliminary evaluation of the three Fi 166 high-altitude fighter studies was compiled in December 1941, by the OKH (Oberkommando des Heeres – Army High Command) at the Heeresversuchsanstalt Peenemünde. These preliminary studies were superseded by two refined proposals, the long-range Höhenjäger I (R-R-FI) and the short-range Höhenjäger II (TL-R-RuR). The vertical takeoff from a ramp mounted on a truck would offer mobility, but the OKH at that stage in the war, lacked the vision to fully appreciate Fieseler's advanced fighter designs. Moreover, the recommended automatic targeting devices were not yet available for service application.

The two-seat, rocket-powered Höhenjäger II had an anticipated maximum endurance of about 45 minutes. Its performance would have permitted two or more separate attacks on an enemy bomber formation. The two-man crew was to consist of the pilot, who was in charge of Spanner or Lichtenstein radar operation, and the observer and radio operator who kept contact with ground control. The aircraft was tracked from the ground by a Würzburg radar on the so-called Seeburg table, on which the aircraft was plotted by Luftwaffe specialists. It was to be launched to its combat ceiling of about 39,370 ft (12,000 m) by a powerful rocket- booster engine which was to be jettisoned after its fuel had been consumed. The booster unit would descend by parachute for recovery and reuse. After reaching its combat ceiling, the pilot would engage the internal rocket to sustain flight. Landing would be accomplished by a retractable, fuselage-mounted skid.

The other proposal, Höhenjäger I, was a single-seat low-wing jet-powered vertical takeoff aircraft. Only one attack was possible due to its limited endurance of only five minutes at 39,370 ft. (12,000 m). A large number of these aircraft would therefore be needed to intercept an Allied bomber formation. In this design, after reaching its combat ceiling by means of a large booster rocket (which resembled a small scale V-2) attached to the underside of the fuselage, the two small wing-mounted jets would be started and the aircraft flown with these engines until its fuel was expended, whereupon the aircraft landed as a glider by means of a fuselage-mounted retractable skid. The development of the R-R-FI (Höhenjäger I) appeared less involved, and the HVA was also of the opinion that the design would be the most efficient. The appearance of promising remote-controlled anti-aircraft missiles coded Schmetterling, Enzian and

28 The RLM GL/C number 166 had previously been assigned to Flugzeugbau Kiel GmbH, for their Fk 166 V1, a small experimental single-seat light biplane with a top wing supported only by fuselage-mounted N-struts. Only one prototype, D-ETON, was completed in 1936.



Von Braun (HVA) Stratosphärenjäger I
July 6, 1939
Liquid-fuel rocket motor

Wasserfall[29] (Butterfly, Gentian and Waterfall), terminated the development of the Fi 166 Höhenjäger I.

Another remote-control vertical takeoff fighter project that failed to win favor was submitted by the HVA to the RLM on October 20, 1944, possibly a redesigned Von Braun Stratosphärenjäger II. The advanced design was comprised of a booster rocket similar to the A4 (the Army's Aggregat 4 – Unit 4 – better known as the V-2), on which a small fighter aircraft similar to the Fi 166 was to be mounted.

In reality, only one experimental vertical takeoff interceptor was available in 1944. This simple innovative project designated Bachem Projekt 20, which was accepted by the Air Ministry and received the official RLM designation Ba 349, was code-named Natter (Viper). It was manufactured in small numbers prior to the end of the war. A second design with vertical takeoff capability, the He P 1077 (see p. 152), failed to materialize except for a few gliders that may have been completed prior to the war's conclusion.

The Bachem Werke GmbH was founded on February 10, 1942, by Dipl.-Ing. Erich Bachem, formerly the Technischer Direktor of the Fieseler firm. The company manufactured spare parts for piston-engine fighters and other aircraft equipment before the Natter project was created.

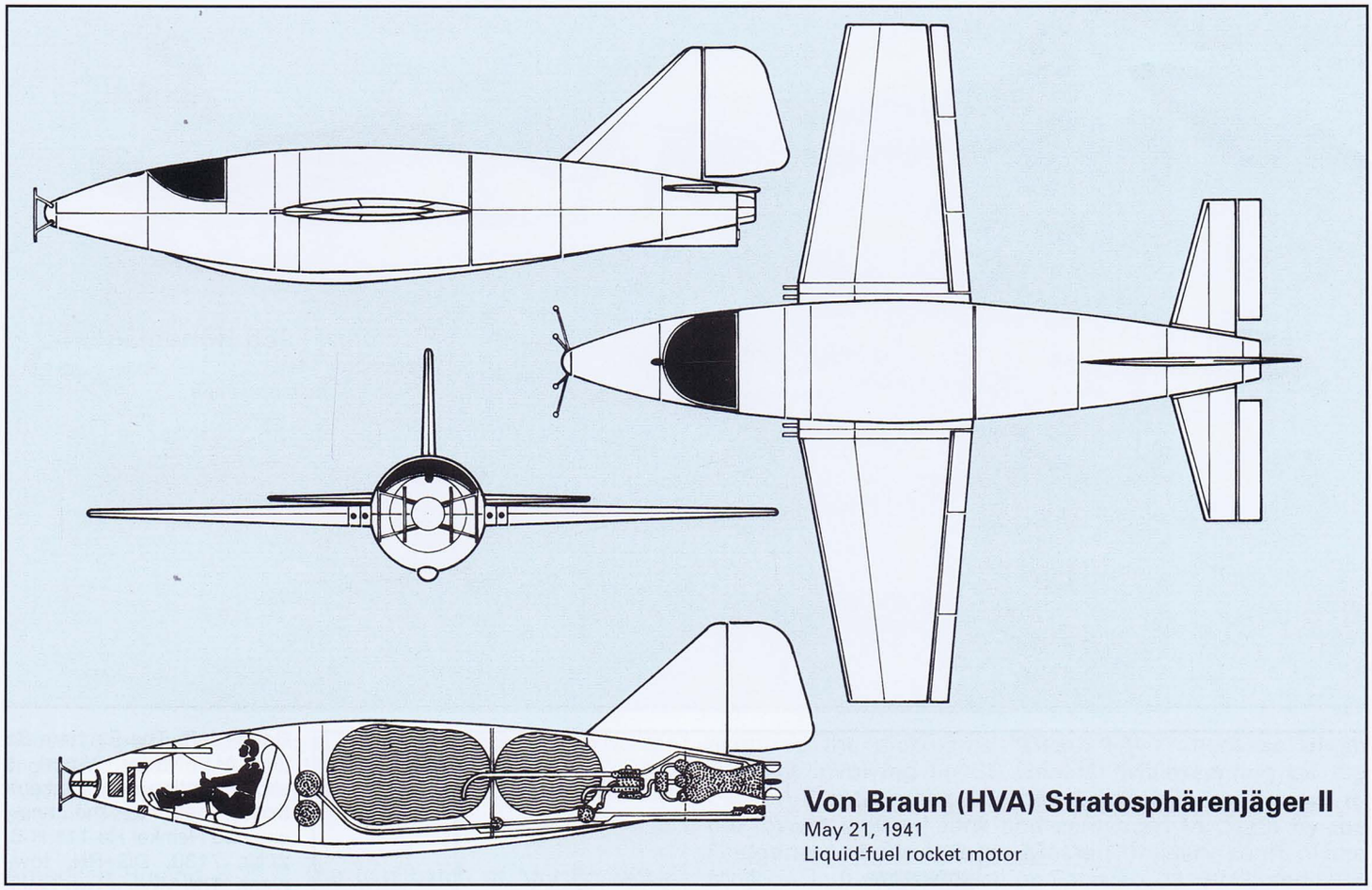
The BP 20 was projected as a small lightweight expendable interceptor, capable of destroying any enemy bomber using the least possible weapon expenditure. To achive this objective, this ambitious project employed a vertical rocket-assisted takeoff followed by separate descent and landing of pilot and aircraft by separate parachutes. It was believed that pilots having little or no experience would need only rudimentary flight and gunnery instruction, rather than spending valuable training resources on the finer points of flight training. Erich Bachem reasoned that, a reasonable number of such interceptors and launch sites could be installed around key industrial targets, to make attacking Allied bombers pay a prohibitively high price. Other attributes of Natter included savings in the area of steel and aviation fuel and the ability to be quickly transported from small, camouflaged sites. The ability to recover the rocket motor for reuse was considered an important feature of this aircraft, which was essentially a manned missile. There were even plans to launch the interceptor from ships if the need arose.

The BP 20 was of wood construction and was to be built without the use of gluing presses. Most of the parts could be made in small woodworking shops throughout Germany, without interfering with the existing needs of the aircraft industry. According to Erich Bachem, only 600 man-hours were required for the production of one airframe, excluding the HWK 509 A-2 rocket motor, which was also relatively simple to manufacture when compared to a sophisticated turbojet. The fuel capacity was to consist of 119 US gallons (450 liters) T-Stoff and 66 US gallons (250 liters) C-Stoff, carried in separate tanks. The available fuel was sufficient for 80 seconds at full power, developing a thrust of about 3,750 lb (1,700 kg). Takeoff assistance was provided by four solid-fuel rockets SR 34 (later designated Startgerät SG 34 – Takeoff device 34), which produced an additional thrust of 2,200 lb (1,000 kg) for twelve seconds.

Natter's weapon systems were simple and potentially devastating. They comprised either a honeycomb 24 electrically fired 73 mm Föhn air-to-air rockets, or 32 R4M air-to-air missiles located behind a jettisonable cover in the nose section. The alternative, the Rheinmetall SG 119 system, consisted of six clusters, each cluster containing seven MK 108 barrels grouped together in a cylinder with the clusters arranged about the Viper's nose as in a revolver.

Bachem submitted his Natter project to the OKL and simultaneously to the SS-Führungshaptamt (SS Planning Office), in August 1944. One month later, a contract for fifteen experimental BP 20 aircraft was awarded, and a few weeks later, Natter was included in the Jäger-Notprogramm (Emergency Fighter Program). The first experimental aircraft, the Ba 349 M1 and M2, were under construction in October 1944, at a time when the RLM believed the Natter could be successfully employed against Allied heavy bombers, including the anticipated

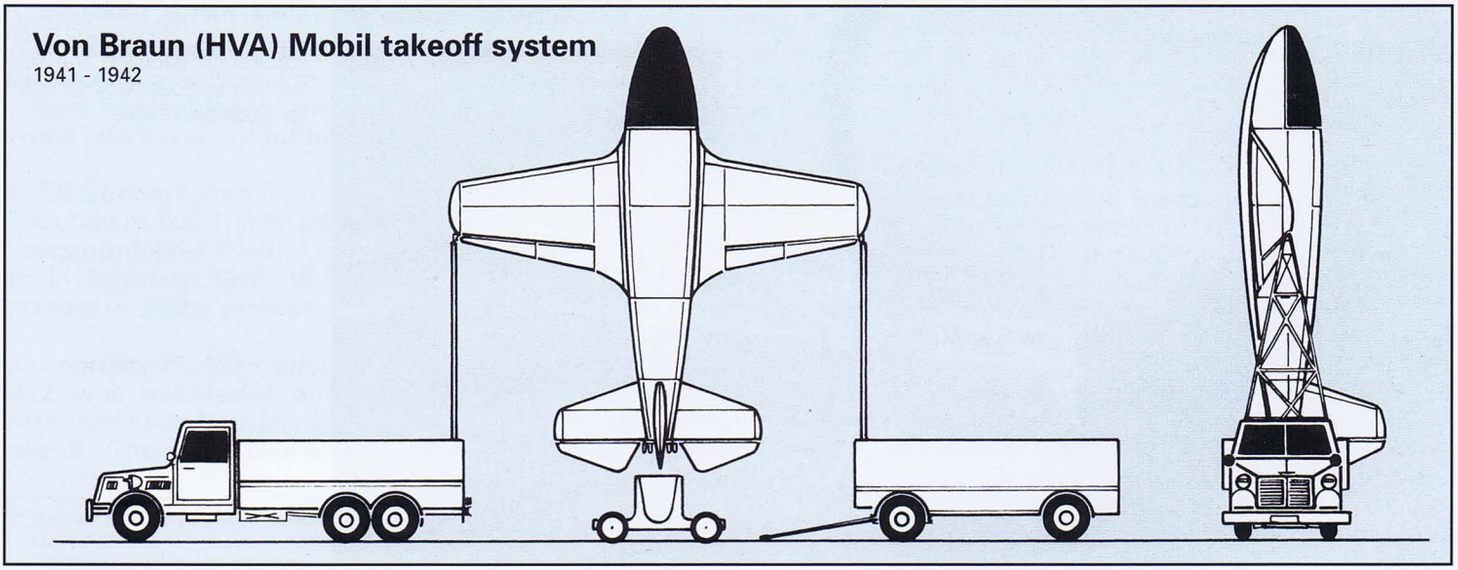
29 Respectively, the Henschel Hs 117, the Messerschmitt Enzian and the Elektromechanische Werk Wasserfall.

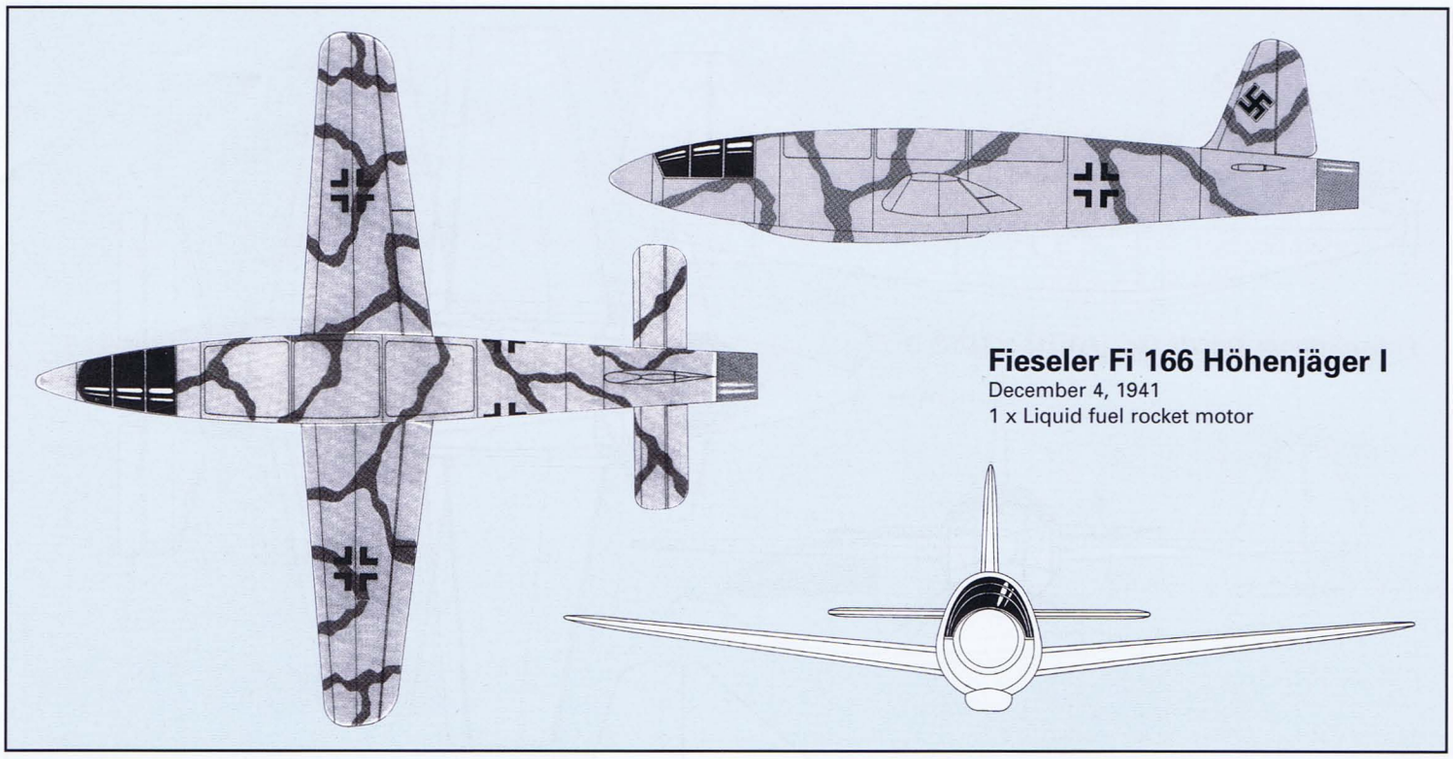


Von Braun (HVA) Stratosphärenjäger II
May 21, 1941
Liquid-fuel rocket motor

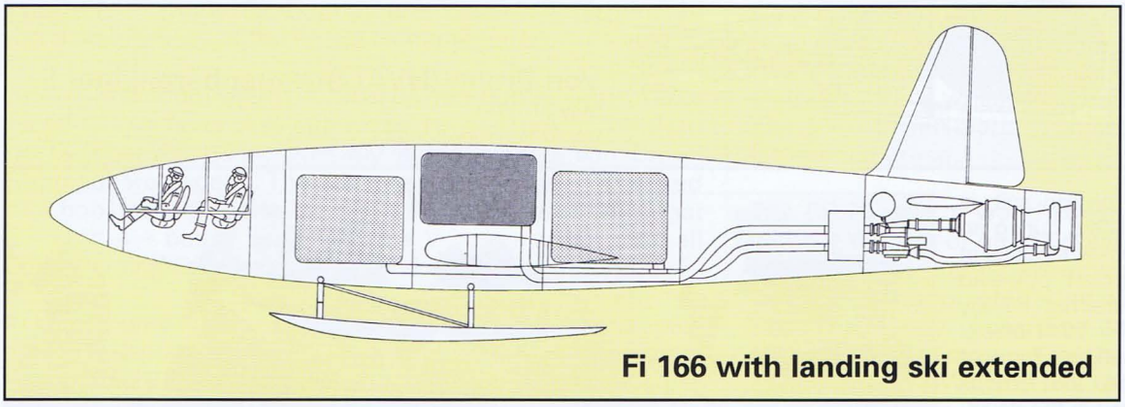
Right: Wernher von Braun, in civilian suit, is surrounded by senior Army officers during an official inspection tour of the rocket facilities at Peenemünde. Von Braun's rocket powered interceptor project studies were not initially appreciated by the RLM, but by 1944 official attitude had shifted in favor of this form of interception. But, by this time, the famous rocket scientist was fully involved in the development of the Army's A4 (V-2) and other advanced rocket missiles, and therefore contributed nothing further in the area of manned interceptors.

Von Braun (HVA) Mobil takeoff system
1941 - 1942

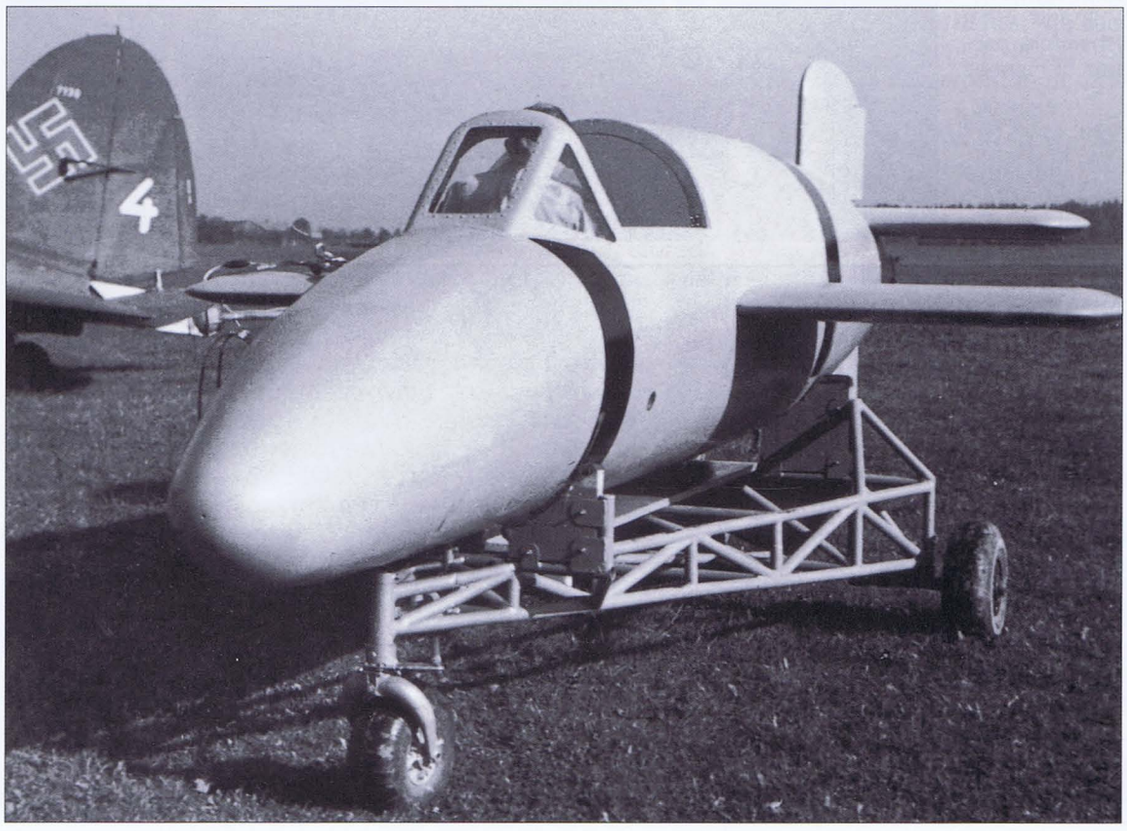




Fieseler Fi 166 Höhenjäger I
December 4, 1941
1 x Liquid fuel rocket motor



Fi 166 with landing ski extended



Below left: The Bachem Ba 349 M1 Natter (Viper) is shown resting on its takeoff trolley next to the twin-engined Heinkel He 111 H-6, W.Nr. 7130, DG+RN, tow-plane. The Viper's two black stripes painted on the fuselage denote the three principal sections to the aircraft. Note that the aircraft's canopy has not been attached at the time this photograph was taken. The operational plan called for the aircraft to be broken down into its three major components following the completion of its mission. The nose section would fall free, the center section containing the cockpit, would also free fall once the pilot disengaged himself prior to activating his parachute. Only the aft section, containing the rocket motor, was fitted with a parachute. It would be deployed upon separation allowing the rear section to float back to earth for possible reuse.

Above: Flugkapitän Zacher (right) enjoys a light moment with Natter engineers next to the Ba 349 M8 at Heuburg. Note the Me 262 of KG(J) 54 in the background. This unit also operated from this base early in 1945.

American Boeing B-29.[30] The first batch of fifty Ba 349s was ordered for delivery between October 1944, and January 1945. A measure of the importance attached to the program is in the substantial order of 200 Vipers at the start of mass production.

The installation of parachutes delayed flight testing of the first target defense prototype, the Ba 349 M1, until November 1944. The Ba 349 M2 was completed soon thereafter and the first takeoff under air-tow of the third prototype, Ba 349 M3, was made at Neuburg on the Danube on December 14, 1944. A second flight behind a He 111 H-6, DG+RN, operated by the DFS, followed eight days later. After successful completion of ground tests near Bad Waldsee on December 18, 1944, the first vertical launch from a ramp was scheduled. This event was marred when the Viper caught fire as a result of a technical fault. The next attempt was made four days later at Heuberg Hill near Stetten am kalten Markt. The aircraft was towed to an altitude of 2,460 ft (750 m) and parachutes were deployed to carry the Viper and its simulated pilot safely to ground. The second takeoff occurred on December 29, 1944, without serious incident while simultaneously, other Vipers were towed into the air for further testing.

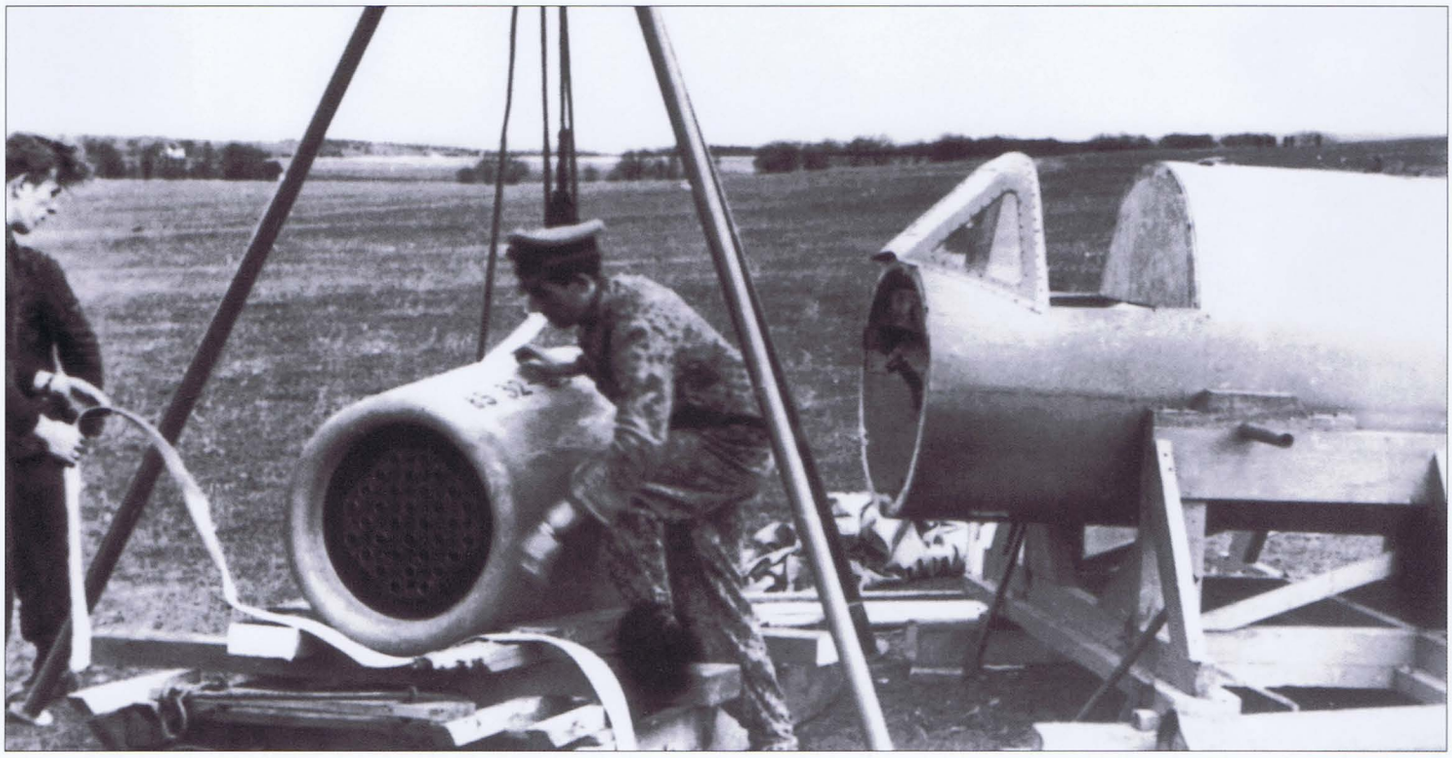
A SS-Sonderkommando 600 Natter (N) (SS Special Detachment 600 Natter [N]) under the command of SS-Obersturmführer (First Lt.) Ing. Gerhard Schaller, was set up in February 1945, to supervise and assist with an increase in Natter production.

On February 25, 1945, another unmanned launch with the M22 was successful and the SS-Führungshauptamt instructed Erich Bachem to go ahead with the first piloted takeoff. The pilot Gefreiter (PFC) Lothar Sieber, had acquired the nick-name "Death Flyer" because of an incident involving an SS General while serving on the Eastern Front. Lothar, a former Leutnant, was reduced to the lowest enlisted rank and sentenced to death by the Feldgericht of the Luftgau Moskau (military court of the Moscow Luftwaffe district) on February 11, 1943, and later given the opportunity to have his sentence commuted if he volunteered to fly Vipers. The hapless Sieber took the chance on March 1, 1945, when the reluctant Viper pilot entered the small cockpit of the Ba 349 M23. When the Viper's rapid acceleration astonished Sieber, he inexpliably jettisoned the Viper's canopy whereupon he immediately lost control. Fifty-five seconds later, Sieber lost his life when the tumbling M23 crashed.

Several more unmanned Natter aircraft, having a modified guidance system and improved equipment, were tested. When the first operational deployment was prepared, the officer in-charge, General Dornberger, terminated Natter development. Nevertheless, the first operational mission, code-named Krokus (Crocus) was in preparation near Stuttgart until the arrival of American ground forces. French armor advanced into Waldsee on April 24, 1945, and a great number of spare parts was captured. Only a few days before the French arrived, fifteen rocket engines destined for Vipers had been thrown into Lake Waldsee to prevent their capture. The secret was not well kept however, and all were later recovered.

Plans for mass production of the Ba 349 A-1,Entwurf 1, (Design 1) were authorized on March 1, 1945, but only a few Natters were actually completed. These were followed by the improved Ba 349 B-1 (Entwurf 2) interceptors, which were to be produced at Waldsee, but few were actually completed. The final design, Ba 349 C-1 (Entwurf 3) was similar to the B-series apart from a modified wing and a redesigned tail, but the course of the war prevented this variant from being completed. Plans were made for the production of the improved Natter in central Germany beginning in May 1945. First flying-scale models were constructed by the FAG, Flugtechnische Arbeitsgemeinschaft Stettin, (Aeronautical Work Group located at Stettin), under the direction of Ing. Göhring. One of the models was

30 German fears about the imminent appearance of the B-29 in the skies over Europe proved unfounded as it was restricted to the Pacific Theater of Operations against the Japanese.



Above: An enlisted member of the SS-Sonderkommando 600 Natter (N) supervises the assembly of a Viper. This unit was set up in 1945 at Bad Waldsee and surrounding villages and eventually consisted of a compliment of about 600 men. Inscription on the nose (B3-32) identifies its weaponry as thirty-two R4M air-to-air rockets contained in a different enclosure to that shown on page 170.

powered by a solid-fuel rocket to evaluate takeoff characteristics. Practical tests carried out at Peenemünde, where a first test conducted during February 1945, proved unsuccessful. Willy A. Fiedler, a testing engineer working for the RLM, was sent to the Heuberg Hills to oversee the program. Erich Bachem is quoted after the war as having said that about twenty Vipers had been used for practical tests. Fifteen were of the A-series, and four B-series aircraft. All were constructed at Waldsee. Still others were assembled by the Wolf Hirth glider factory. Four additional Ba 349s, possibly of the B-series, were captured at the end of the war by Allied forces near St. Leonhard, Austria.

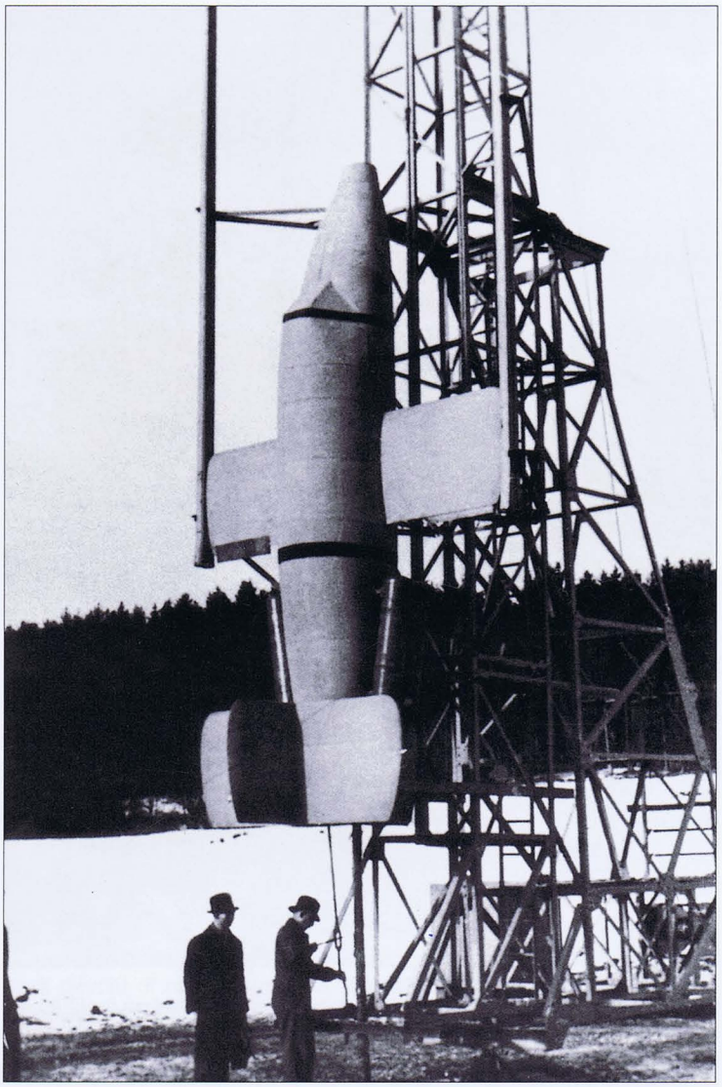
Without doubt, one of the most unusual fighter projects to be devised during the life of the Third Reich was the Focke-Wulf Triebflügeljäger (rotating wing fighter) created by Professor von Holst and Dr. Küchemann, of the Göttingen Technical University. Erich von Holst had participated at the Saalflugwettbewerb (Indoor Flying Scale- Model Competition) held at Breslau in 1940, where he demonstrated his model, identified as the Libelle (Dragonfly). He also referred to this creation as the Schwingenflugzeug (Ornithopter, flapping wing aircraft). After investigating several different design approaches, he published his findings in the *Jahrbuch der Luftfahrtforschung* (Aeronautical Research Annual) of 1942.

Beginning in 1943, Focke-Wulf actively tried to find a reliable method of increasing the thrust of a conventional Lorin ramjet, following Dr. Sänger's research that proved this type of propulsion to be the most efficient way to accelerate advanced fighters. Dr. O. Pabst, head of Focke-Wulf's development department, and Dr.-Ing. Theodor Zobel, his most experienced colleague, had designed an engine that had a reduced drag coefficient due to its clean shape. By March 1944, it had been ascertained that the Lorin ramjet would work efficiently up to altitudes of 59,000 ft (18,000 m). Another advantage of the system was that cheap fuels and oils worked well. The first test model was finished in August 1944, but testing was delayed for several months due to Allied air raids. It was impossible to complete certain essential sections, and the promised fuel was not available in time. During July 1944, the OKL had decided that four airworthy Lorin ramjets would be be built by August 1945. Also, in 1944, Focke-Wulf engineers had designed a Lorin ramjet powered Strahlrohr-Bomber (Lorin ramjet bomber), followed by a fighter bomber and some designs of fast fighters.

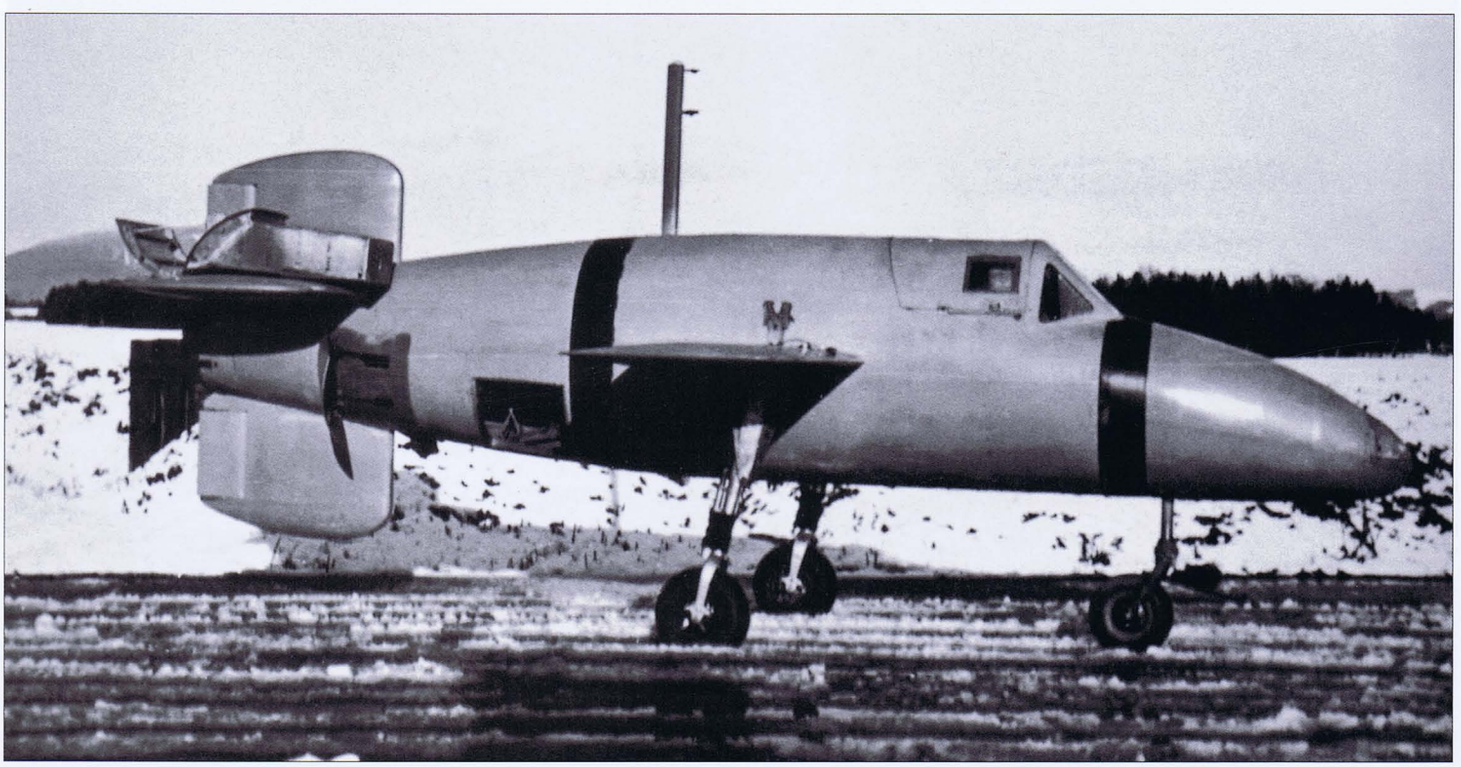
According to Focke-Wulf's overview, the Triebflügeljäger had the following advantages: high efficiency, low fuel consumption, lightweight, and a high ceiling; furthermore, its engine would run on any combustible medium, gaseous or liquid, which could be vaporized. In the case of engine failure, three HWK rockets would ensure a safe landing.

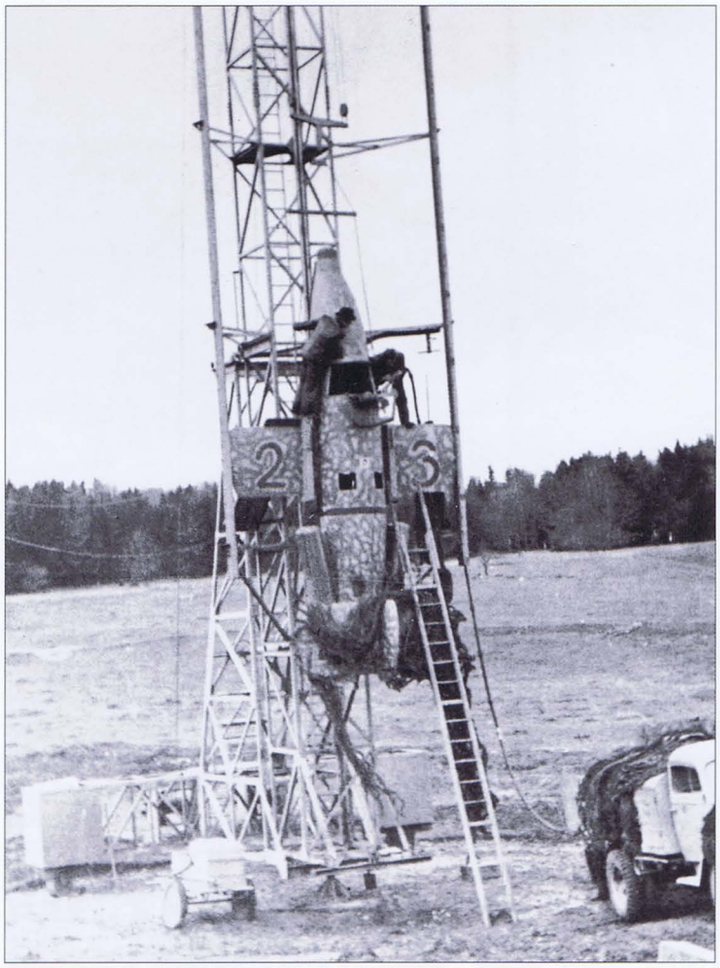
The most important theoretical work on the Triebflügel jäger was contributed by Dipl-Ing. Flugbaumeister Heinz van Halem, a highly qualified and gifted engineer. He had joined the Focke-Wulf development department in the summer of 1944, becoming part of a team of experienced designers and engineers. The Triebflügel was an aircraft whose wings were replaced by three airfoil-shaped rotor blades, each with a ramjet propulsion unit at its tip. The pitch of the rotors could be adjusted by the pilot. At the top speed of 453 mph (730 km/h), normally used only during the climb, the rotating velocity of the ramjets would be much higher than the aircraft's forward speed. In this manner, efficient functioning of the ramjets would be ensured even at low airspeeds. The greater the forward speed of the aircraft, the slower the rotation of the wings, and the smaller the difference between ramjet speed and airspeed.

For takeoff, the aircraft stood vertically on its main wheel located in a pod at the tip of the rear fuselage, while each of the cruciform tailplanes also had smaller auxiliary wheels. For initial wing rotation, three Walter rockets were ignited, one in each ramjet. When the correct rotation

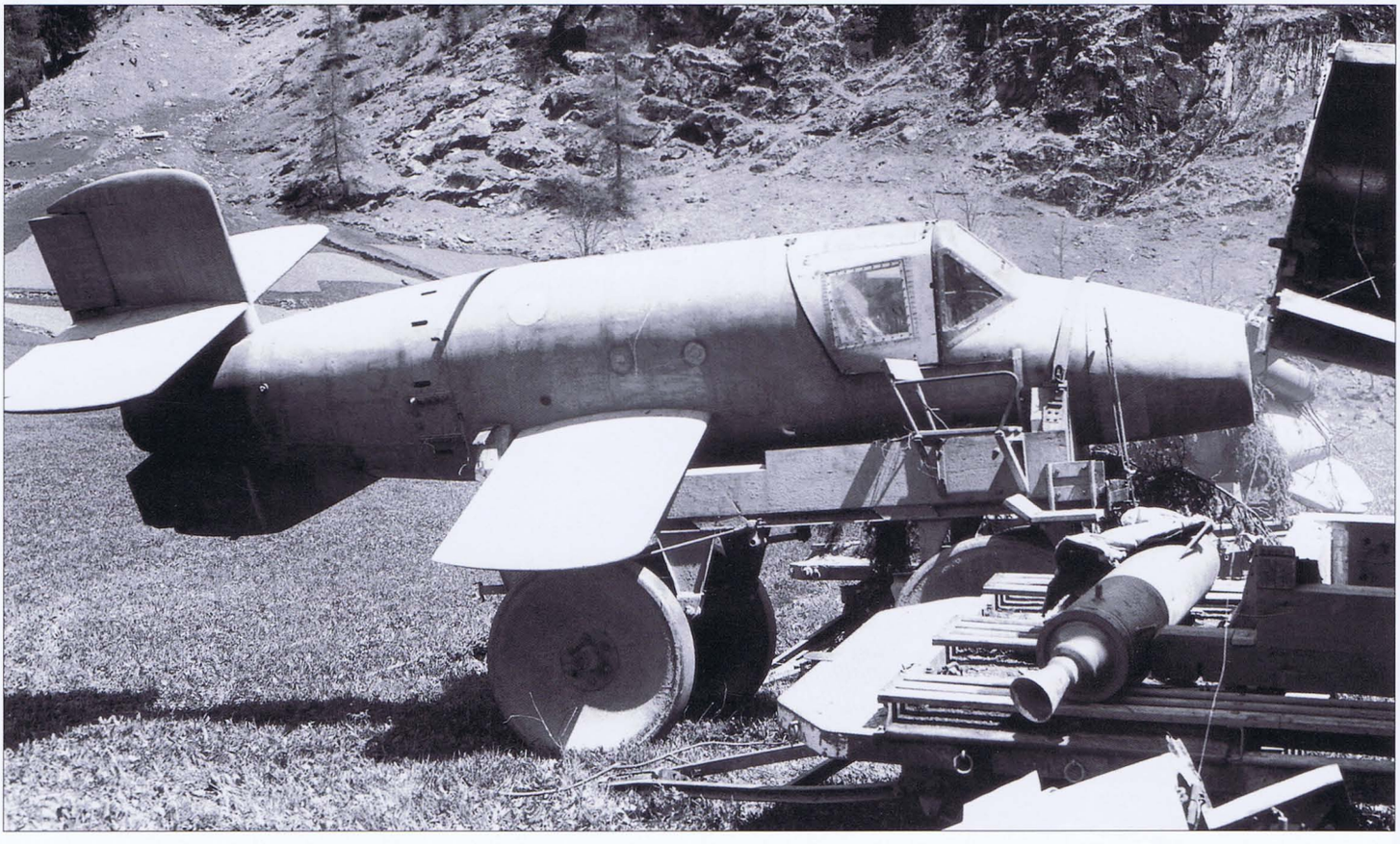


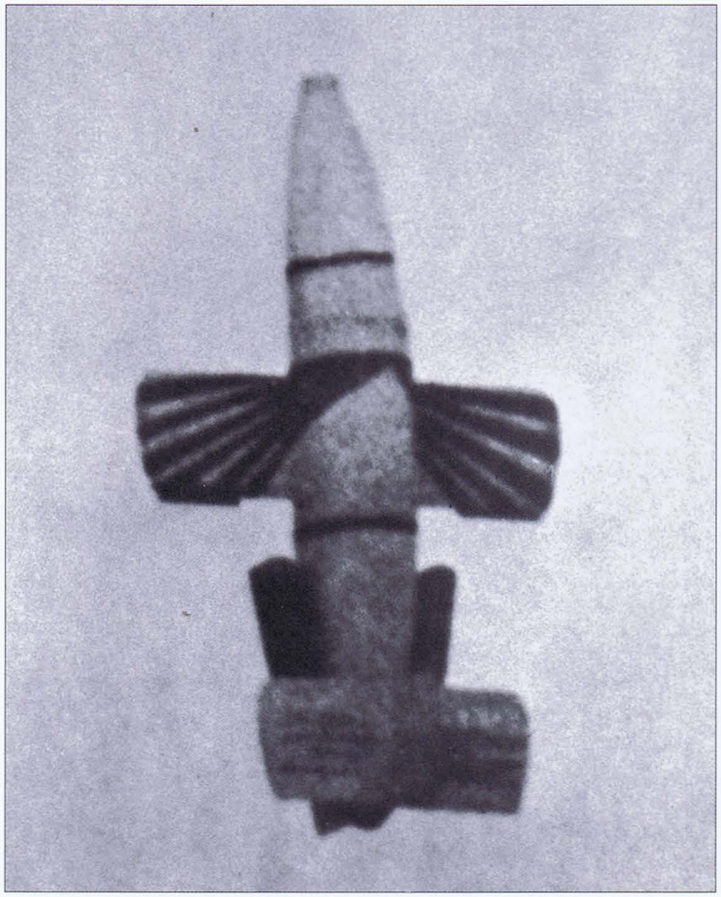
Above: The Viper's creator, Dipl.-Ing. Erich Bachem, poses next to a scale model of the Ba 349 after the war. **Above right:** A pilotless prototype Ba 349 is shown on its vertical launching track at Heuberg mountain near Stetten am kalten Markt. **Below:** The Ba 349 M3 after its landing on December 14, 1944, at Heuburg damaging the main undercarriage. Note the extended rear fuselage air brake and open hatch that contained the fuselage parachute. Vertical shaft near the mid fuselage is not part of the aircraft.

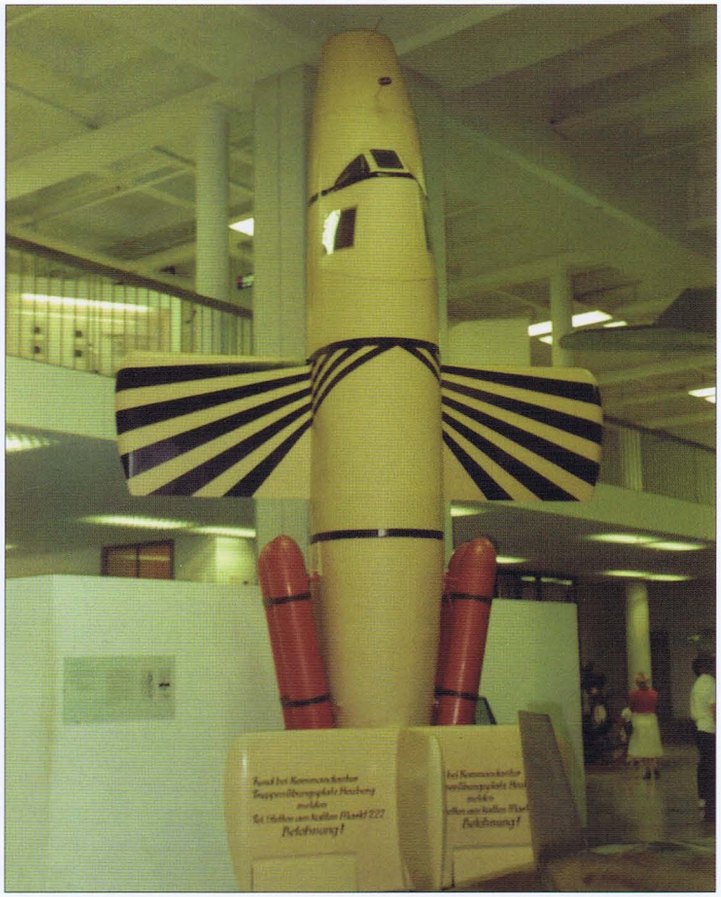




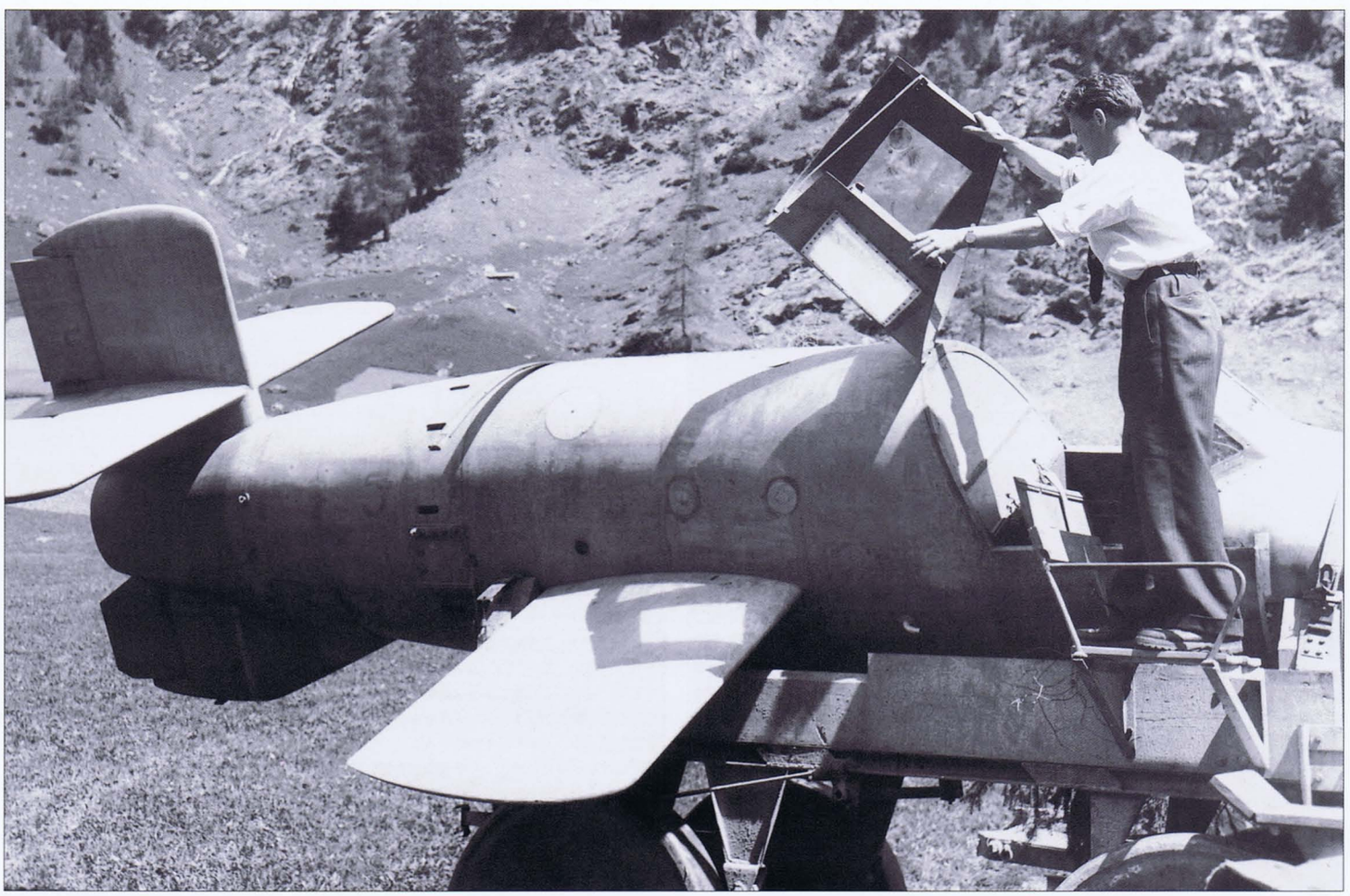
Above: The ill-fated Ba 349 M23 is shown being fueled on its launch tower on March 1, 1945. **Above right:** A second after launch with Lothar Sieber strapped in the cockpit of the M23, all appears normal. But, within another second the canopy would fly off, Sieber would loose control and perish in the ensuing crash. It has been speculated that even with a thorough pre-flight, Sieber was not ready for the Viper's astonishing acceleration. **Below:** One of five nearly completed (but unpainted) Ba 349 B-1s captured at St. Leonhard near Salzburg, Austria, on its solid-wheel transport wagon.

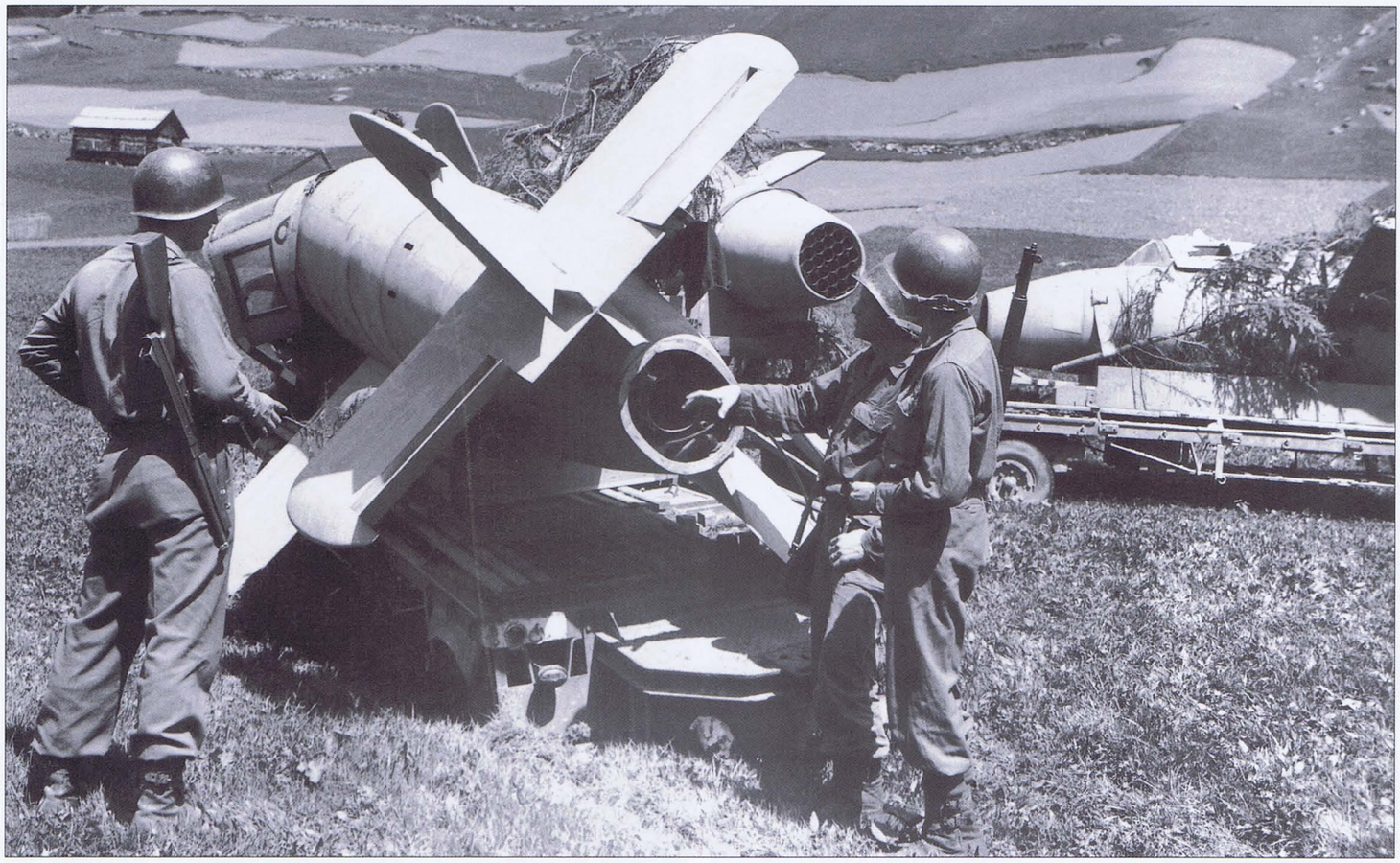




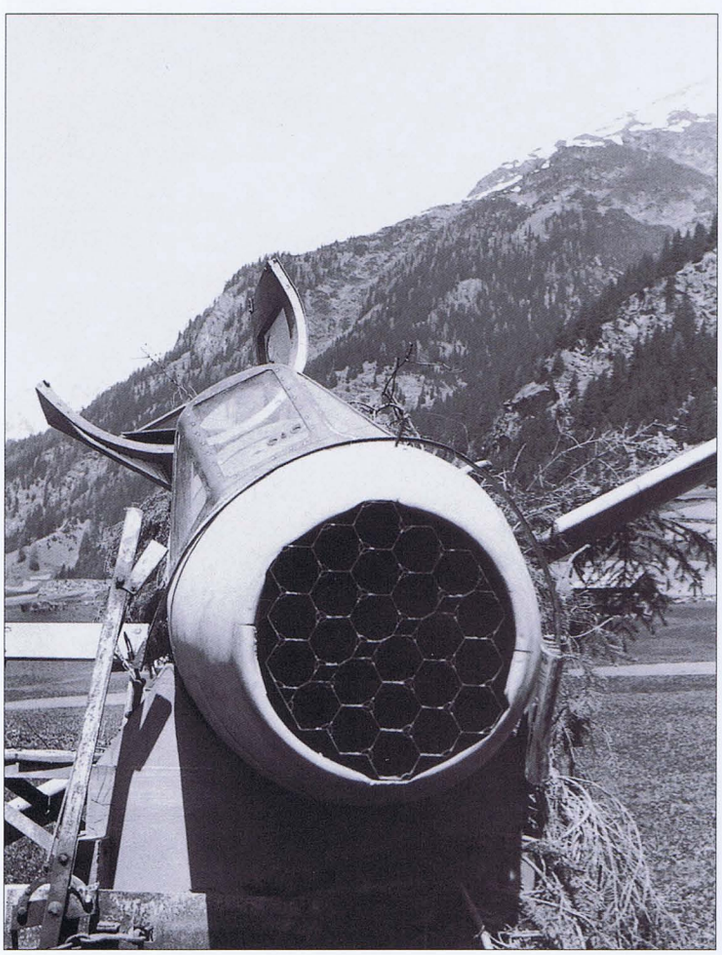


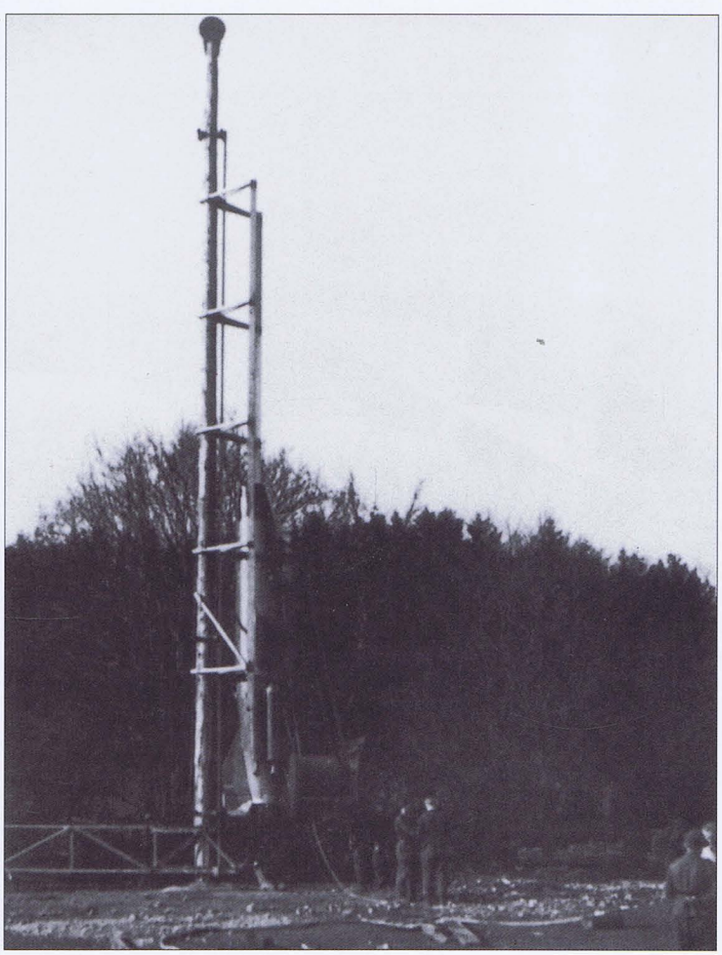
Above: An early pilotless Viper streak's upward after launch. **Above right:** This Ba 349, on exhibit at the Deutsches Museum in Munich, is painted to resemble the distinctive tracking scheme of the prototype shown above complete with instructions printed on the horizontal tailplane to notify the base commander at Heuberg if found. Operational Natters would have been painted in camouflage colors, but devoid of national insignia. **Below:** Dr. Heinz Rieck, of the DFS, holds the canopy open to the aircraft shown opposite.

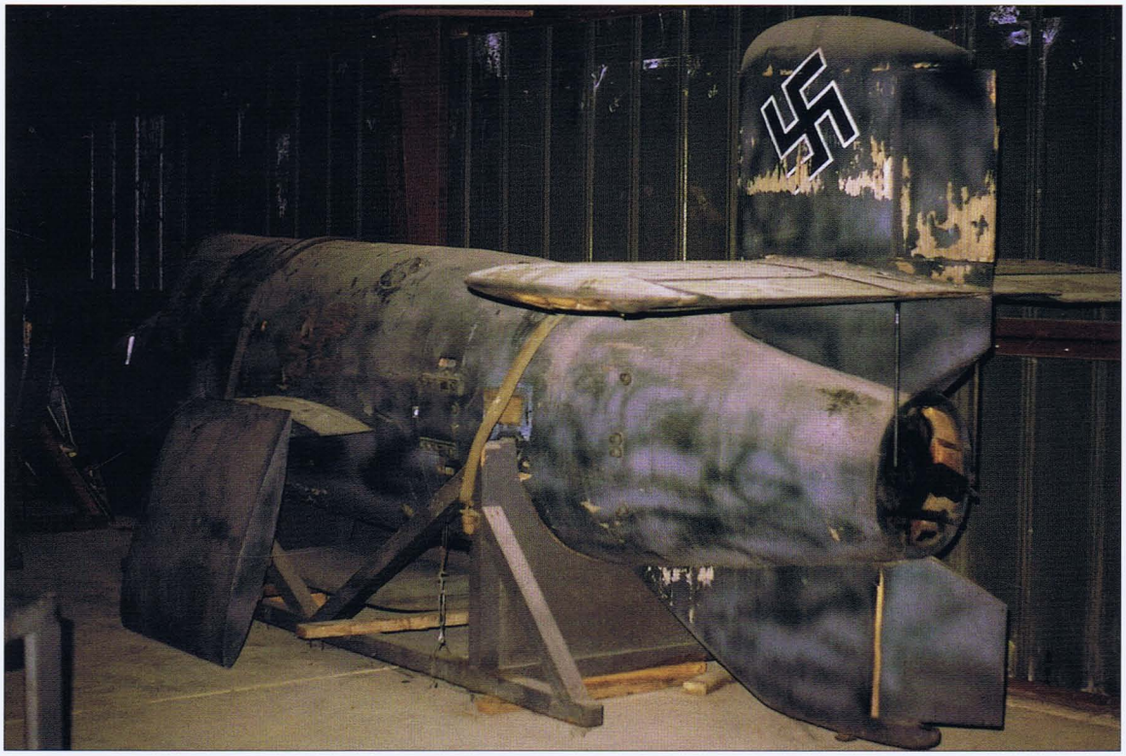




Above: American troops discuss the Viper's characteristics soon after the aircraft were captured at St. Leonhard. One of these aircraft was subsequently shipped to the United States (shown opposite). **Below left:** A close-up of the honeycomb rocket launch cluster for the Ba 349 designed to hold 24 Föhn air-to-air rockets. A plastic nose cover was fitted during transport, but removed prior to launch. **Below right:** A rare photograph of an operational Ba 349 B-1 on its simplified wooden launch tower, taken in the last days of the war.







Above: This Ba 349 B-1 was captured in Austria and shipped to Freeman Field, Indiana, where it received Foreign Equipment number FE-1 (later T2-1). The aircraft is complete except for its rocket motor, and is currently in storage for the National Air and Space Museum. The camouflage, while convincing, is American applied. Similarly, the swastika is not original. Operational Vipers did not carry national aircraft insignia.

speed was reached, then the ramjets would start, whereupon the smaller rockets were shut down. During this stage, the wing pitch was neutral, when they were moved to fine pitch, lift was generated to the aircraft, due partly to both the rotation of the wings, and the ramjets' thrust being parallel to the longitudinal axis of the fuselage. After climbing and leveling off, coarse pitch was applied and rotation speed reduced accordingly, in order to maintain a constant speed at the wing tips of about 683 mph (1,100 km/h). At the maximum design speed of the fighter, the wings rotated at a rate of 220 rpm. To land, the pilot had to rotate the aircraft while switching the rotor pitch, enabling the aircraft to vertically descend to its takeoff position. During all flight regimes, the pilot's seat remained fixed in one position. This meant that he was in a reclining position during takeoff and landing. It is interesting to contrast this approach with that of the American VERTOL (Vertical Takeoff and Landing) Convair XFY-1, Pogo, of 1954, in which the gimbal-mounted pilot's seat rotated forward 45 degrees, thus enabling the pilot to fly the aircraft from a more conventional position while it was taking off or landing.

The outstanding fighter performance data, compiled on September 9, 1944, greatly surprised RLM officials: length was 30 ft (9.15 m), with a maximum take-off weight of only 11,355 lb (5,150 kg); the rate of climb at sea level had been calculated at 410 ft/sec (125 m/s), and at 22,965 ft (7,000 m) a rate of 164 ft/sec (50 m/s). The anticipated maximum speed was 575 mph (925 km/h) at sea level and 419 mph (675 km/h) at 45,930 ft (14,000 m). The proposed armament consisted of either two MK 103s (100 rpg) and two MG 151/20s (250 rpg), or four modern high-firepower MK 213s installed on either side of the pressurized cabin.

Unfortunately for the Focke-Wulf VERTOL fighter project, development was interrupted when the Chef TLR ordered termination of all projects under development that required more than a few months for completion. Only the Bachem Natter escaped this cutback. It is also interesting to note that, Triebflügel fighter development seemed so promising to the western Allies that Pabst's and Zobel's reports remained classified by the Americans until January 1955.

Another late war VERTOL proposal, which was never built, was complementary to but distinct from the Focke-Wulf project. Known as the Heinkel Projekt Wespe (Wasp), this 1945 design featured a fuselage with the prone pilot positioned in the extreme nose. A fuselage-mounted He/DB 021 turboprop developing 2,400 hp (1,740 lbst), drove a large six-bladed variable pitch propeller whose hub was located at approximately mid-fuselage. Surrounding and partially enclosing the entire prop arc was a nine-sided circular airfoil that acted as an abbreviated ducted fan enclosure. In addition, a stubby bent wing was attached to the fuselage midpoint connected to the ring airfoil. A vertical surface, in line with the wings was mounted on top of the fuselage, and like the bent wings, aided in supporting the ring airfoil. The triple tailplane incorporating flight control surfaces also supported the fighter's weight on its three-point caster wheels. Armament was to be comprised of two cannon placed in the nose about the cabin. It is unknown how much research had been allocated to this project before the end of the war. Yet another VERTOL project was reportedly under development by Junkers, but its designation, general layout, and anticipated performance remain unknown.

High-speed Fighter Aircraft

The achievement of supersonic flight was one of the major aspirations of German aircraft designers during the Second World War. This goal was supported by the Air Ministry and Propaganda Office, as long as the achievement could be gained without cost to the war effort. To attain high subsonic and transonic speeds, it was essential that a suitable powerplant be developed that was capable of delivering the necessary thrust. Thus, airframe designers eagerly awaited news of the new generation of reaction propulsion

Above: A large-scale model of the Focke-Wulf Triebflügel showing how the aircraft would be positioned for takeoff. Each of the three wing tip ramjets contained small Walter rocket motors that were used for the starting sequence and as a possible back-up system in case of ramjet failure.

engines then under discussion: aeronautical engineers including Alexander Lippisch were very interested in this field of research believing the all-wing aircraft was the correct choice. Lippisch's project, the Lippisch Überschall-Deltajäger (supersonic delta-wing fighter), was an athodyd-propelled aircraft bearing a general resemblance to his Li P 13, but without the large dorsal fin. Instead, a smaller fin appeared at the trailing edge, and the cockpit canopy projected slightly from the wing's upper surface. The sweepback was even more pronounced than that of the Li P 13s. As mentioned before, with the exception of the DM 1 flying test bed, no other Lippisch flying-wings were completed.

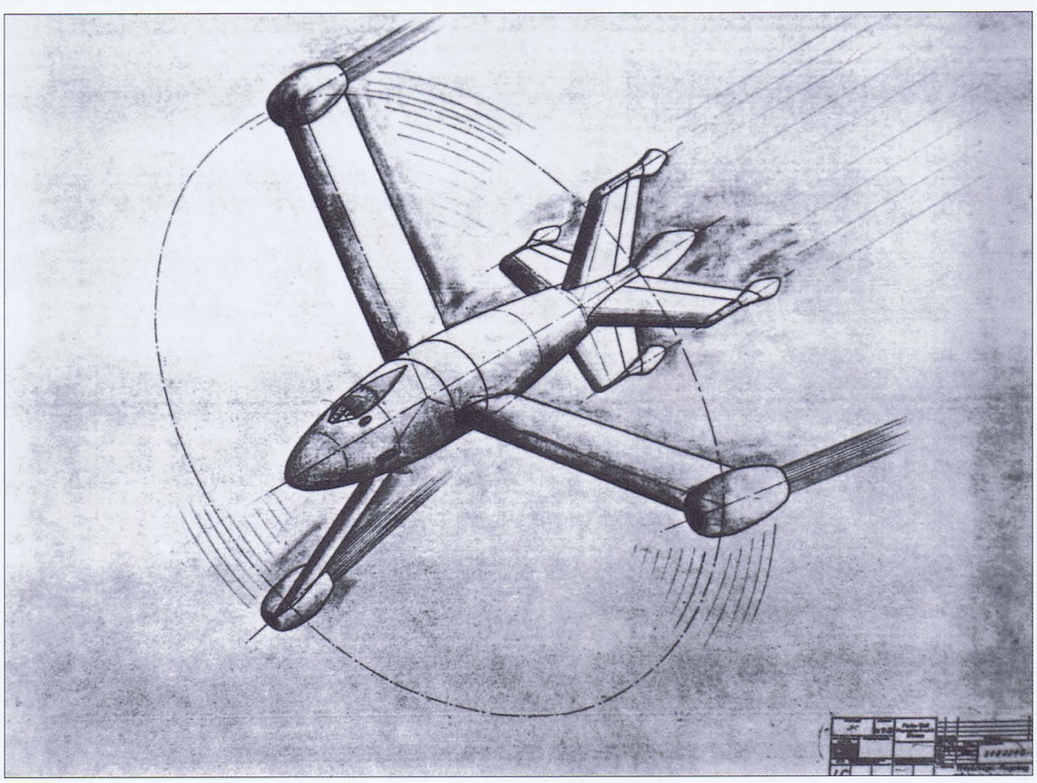
A subsonic all-wing aircraft project was designed by the talented Horten brothers, the Ho 10 A and Ho 10 B. With the exception of a scale model of about 5 ft. (1.50 m) wingspan, no full-size supersonic flying-wings were completed by Horten. The maximum speed this arrow-shaped, delta-wing, fighter project could have attained was in the 680 mph (1,100 km/h) range; well below supersonic flight.

The Horten supersonic aircraft was developed in great secrecy at Bad Hersfeld during 1944 and 1945. A full-scale nonpowered test aircraft, the Ho 13 A, with a 60 degree wing sweepback and a wingspan of 23.6 ft (7.20 m) was completed and successfully flown early in 1945. This paved the way for the construction of the powered version, the Ho 13 B, which was to be fitted with the new BMW 003R. The Hortens calculated that this fighter stood a good chance of breaking the sound barrier (738 mph [1,188 km/h] at sea level). However, in hindsight, it is difficult to believe that the BMW 003R could have provided the necessary power. The final variation, the Ho 13 C, would have employed a near delta configuration with a 70 degree sweep of its leading edge, and was to be powered by an improved HeS 011B turbojet and possibly an auxiliary rocket to achieve a high rate of climb. A top speed of Mach 1.4 was estimated, with the sound barrier being penetrated in a dive. It was unclear whether supersonic flight could then be maintained in level flight. Conventional drag rudders were thought impractical because of the short span and anticipated control forces experienced during transonic flight. Therefore, a small conventional set of twin rudders was proposed. The armament could have been either three MK 108s, MG 151/20s, or MK 213s. The length and wingspan of the Ho 13 B were reported as 39.4 ft (12.00 m) while height was 13.8 ft (4.20 m).

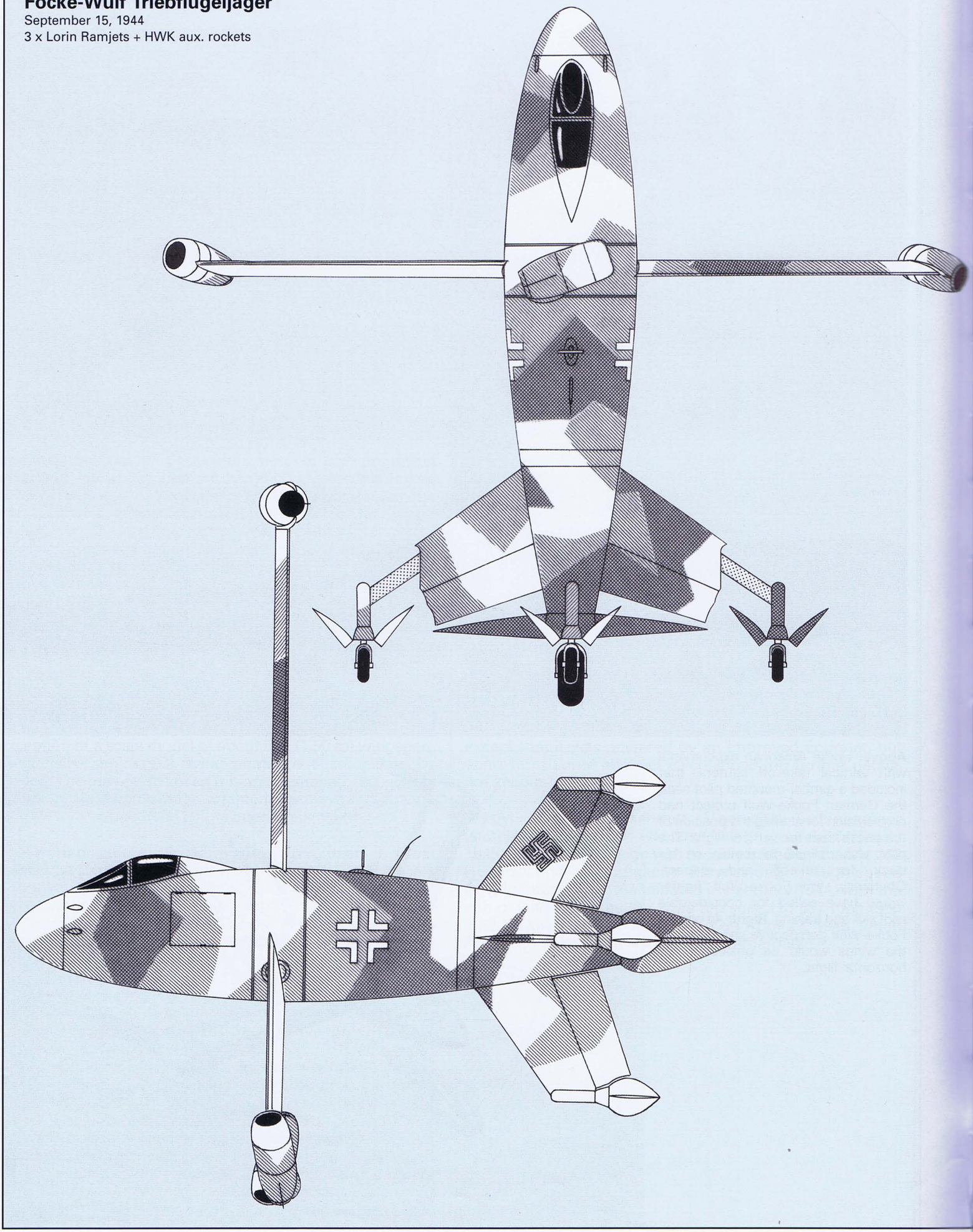
The Sänger Überschall-Staustrahljäger (supersonic ramjet fighter) was among Professor Sänger's well-known series of powerful Lorin-jet designs developed in 1944. The design differed little from his conventional Staustrahljäger, except that it was powered by an improved Lorin-jet, but apart from some abstract calculations, no further details are known.

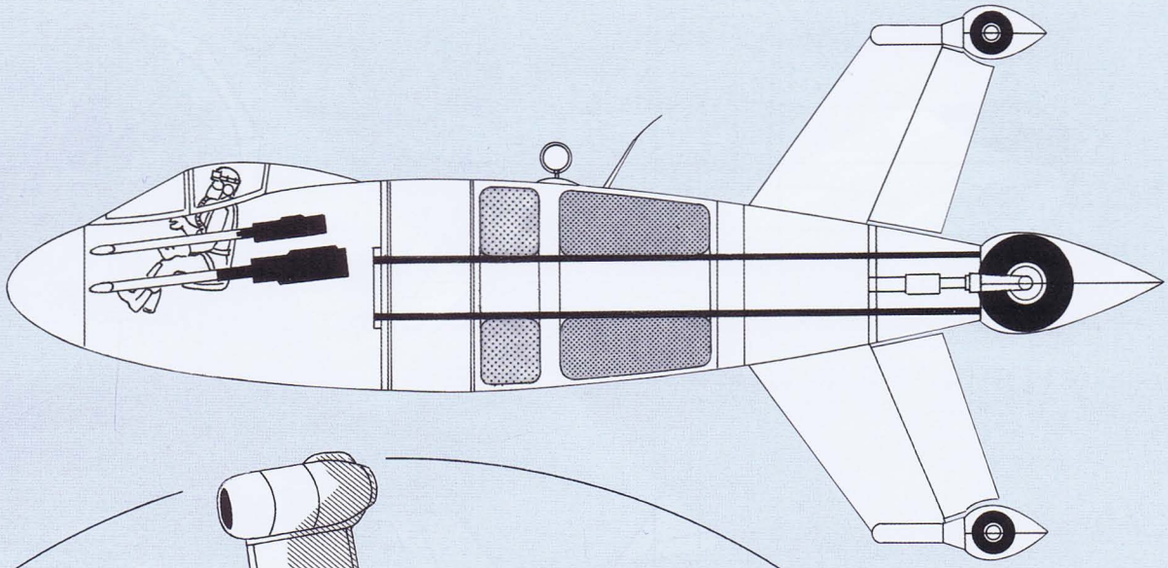
Lastly, the Messerschmitt Überschall-Turbinenjäger (supersonic jet fighter) was also being researched in early 1945. This project design was broadly based on the Me 262 HG (Hochgeschwindigkeits Entwicklung – High-speed Development) and was initiated in February 1944, with the aim of increasing the Me 262's top speed to 597 mph (960 km/h). This work was terminated on April 29, 1945, when American soldiers arrived at Oberammergau.

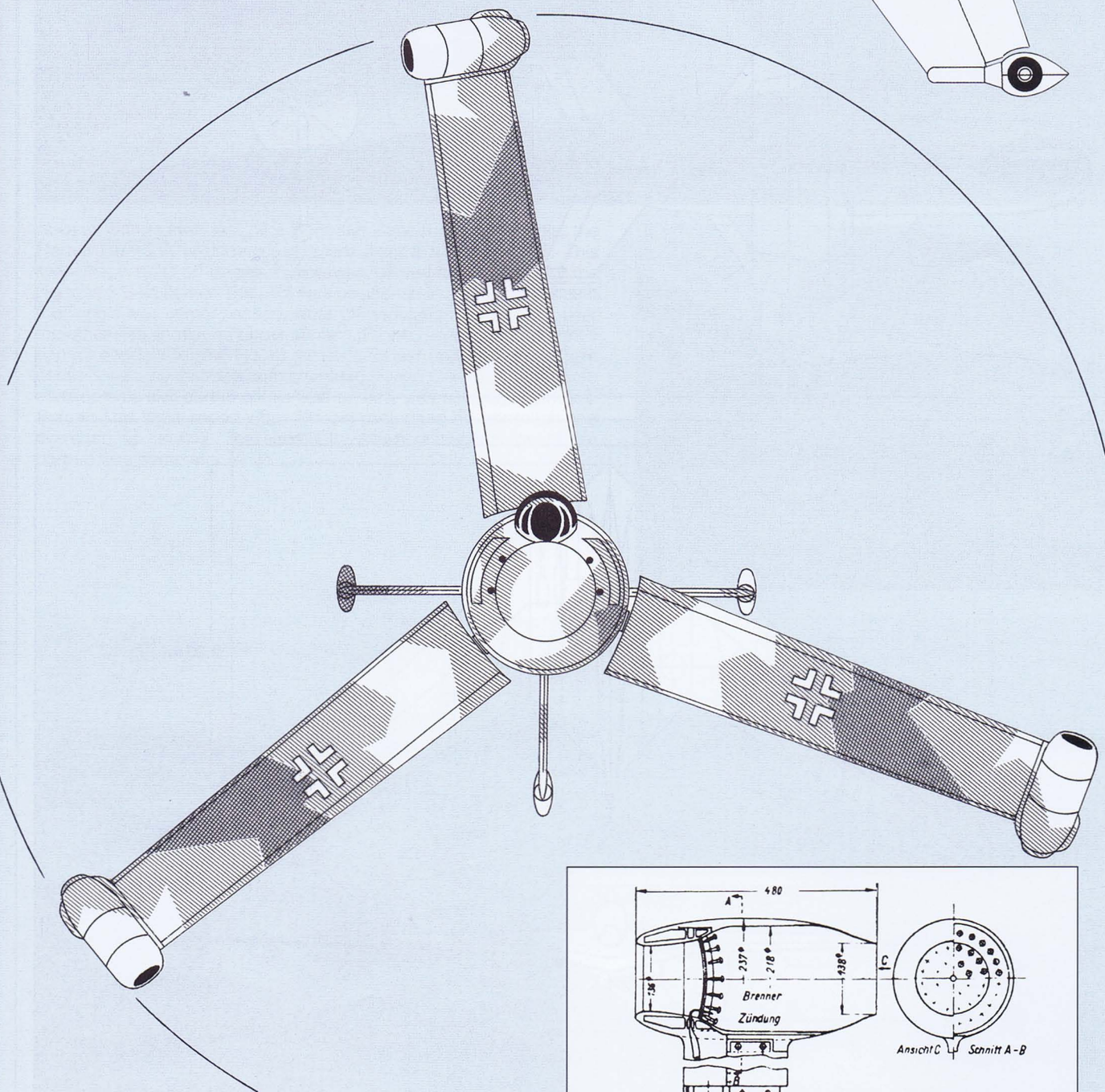
Above: Unlike American experiments with vertical take-off fighters, that included a gimbal-mounted pilot seat, the German Focke-Wulf project had no provision for altering the position of the pilot's seat for vertical flight. The pilot was obliged to remain on his back for takeoff and decent. Obviously, the Focke-Wulf fighter would have called for considerable pilot skill and training. **Right:** An original Focke-Wulf perspective showing how the wings would be positioned for horizontal flight.



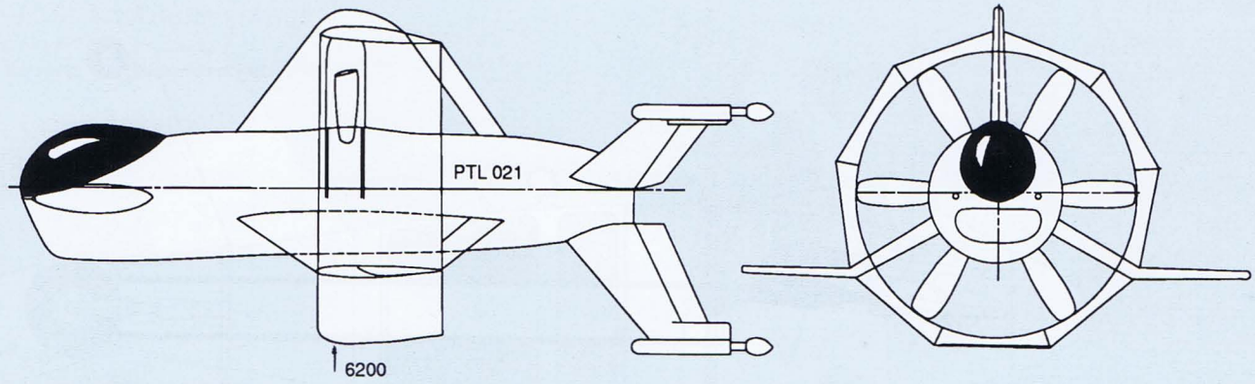
Focke-Wulf Triebflügeljäger
September 15, 1944
3 x Lorin Ramjets + HWK aux. rockets





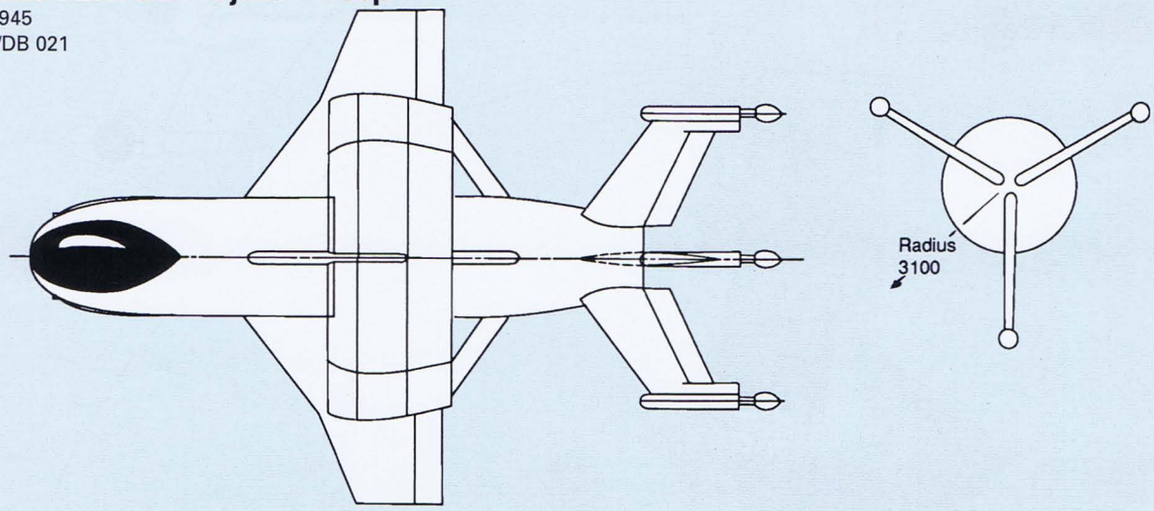


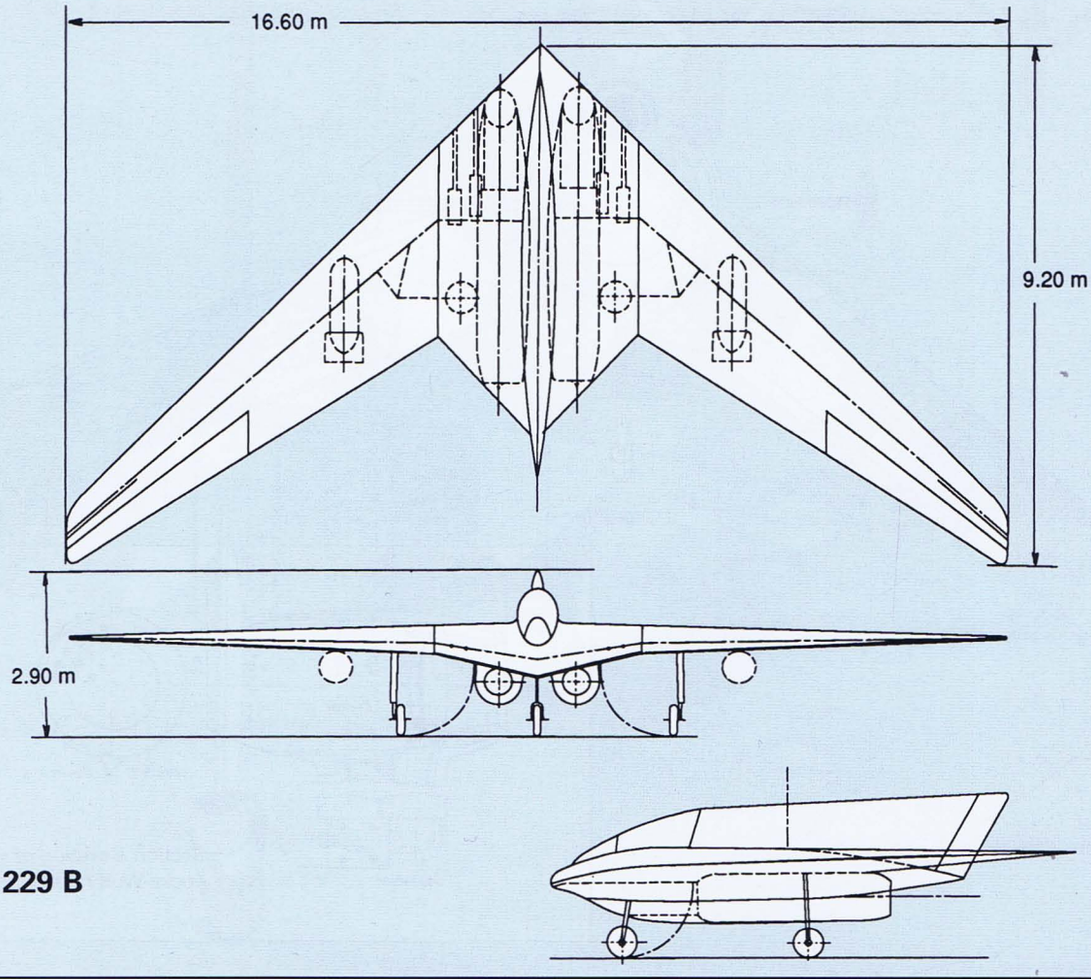
Section elevation of
Focke-Wulf ramjet



Heinkel VERTOL Project - Wasp

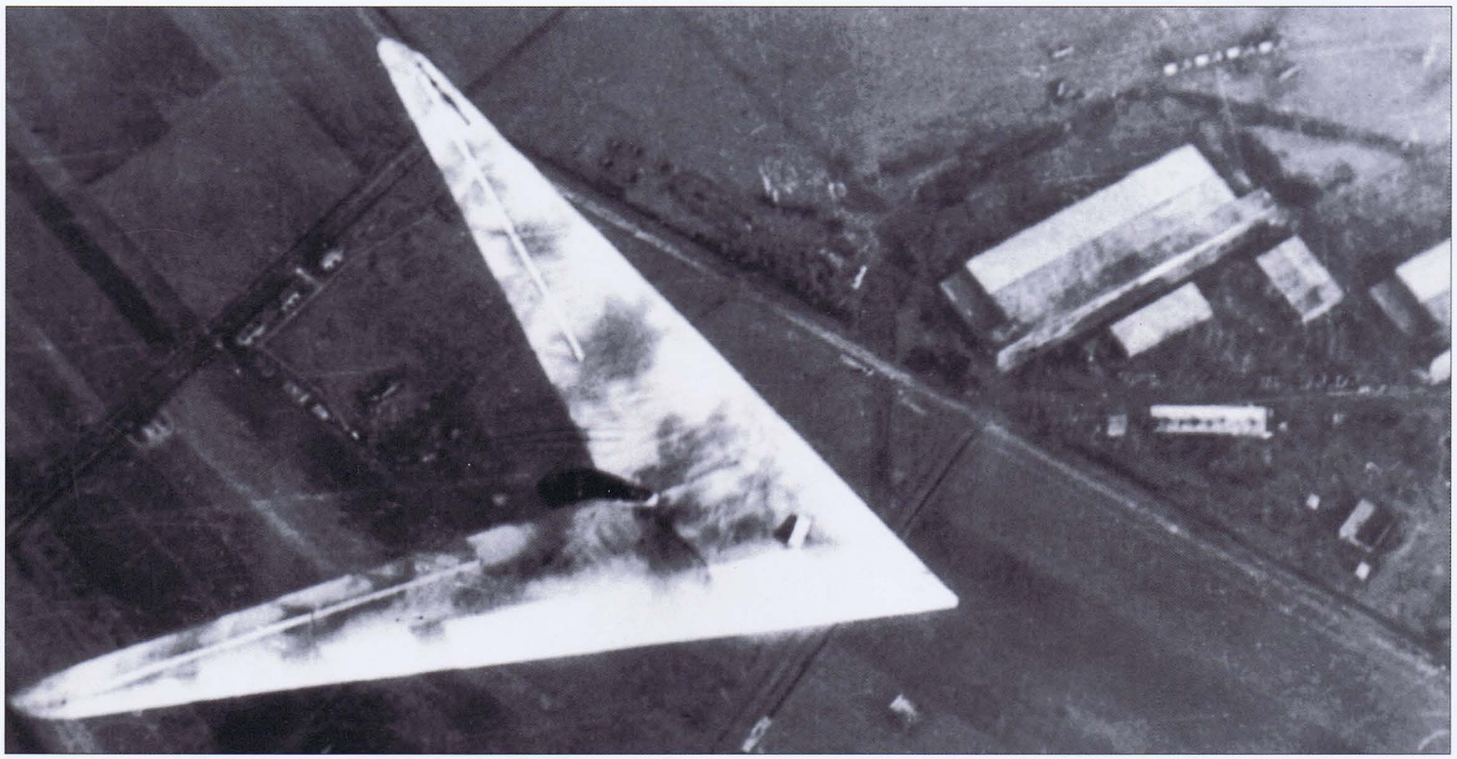
April 1945
1 x He/DB 021



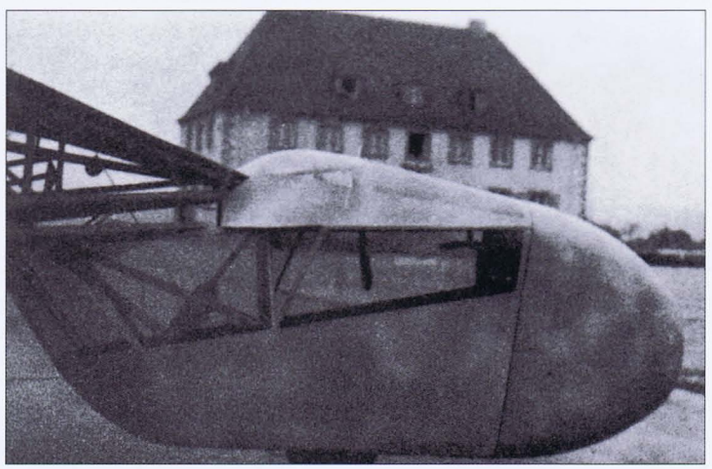


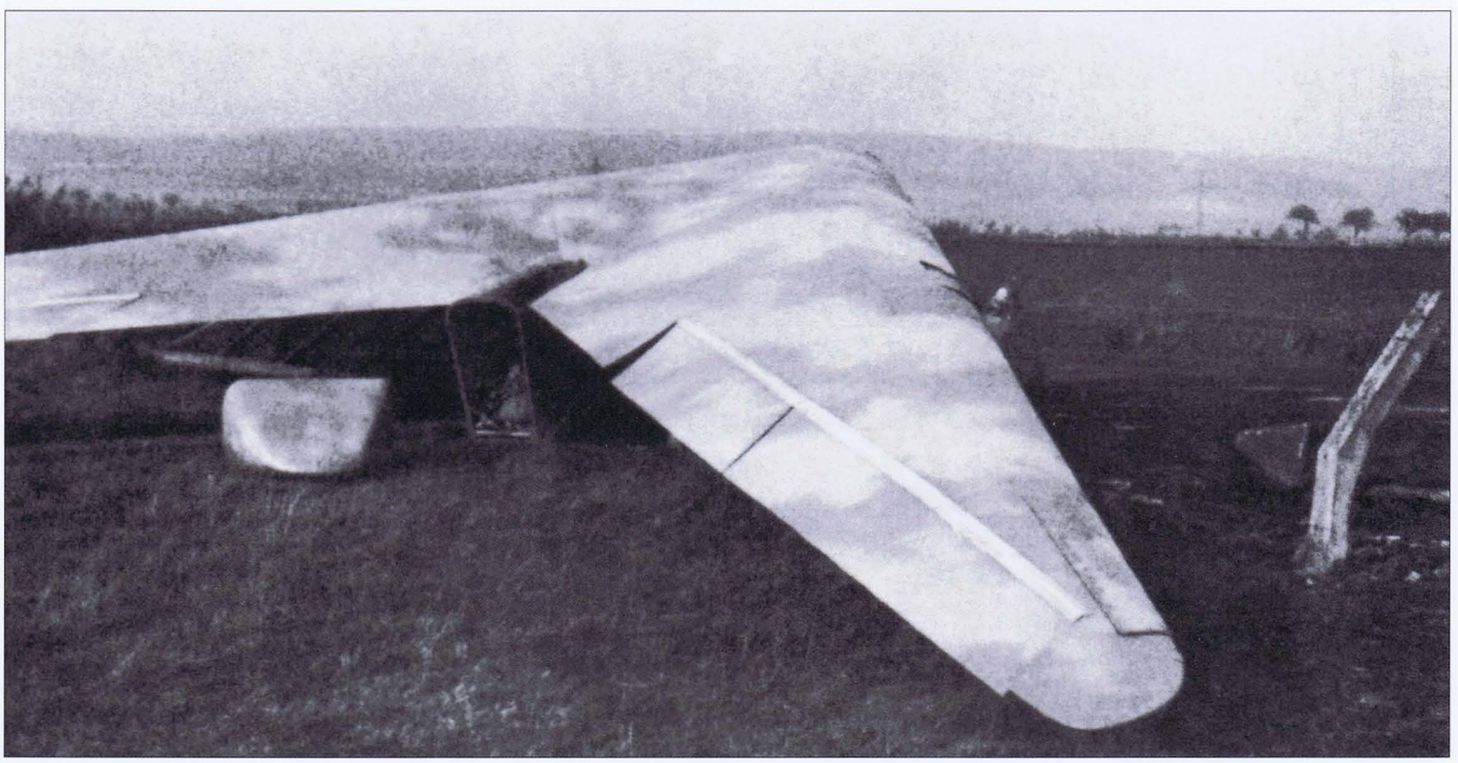
Horten Ho 229 B

March 1945
2 x Jumo 004



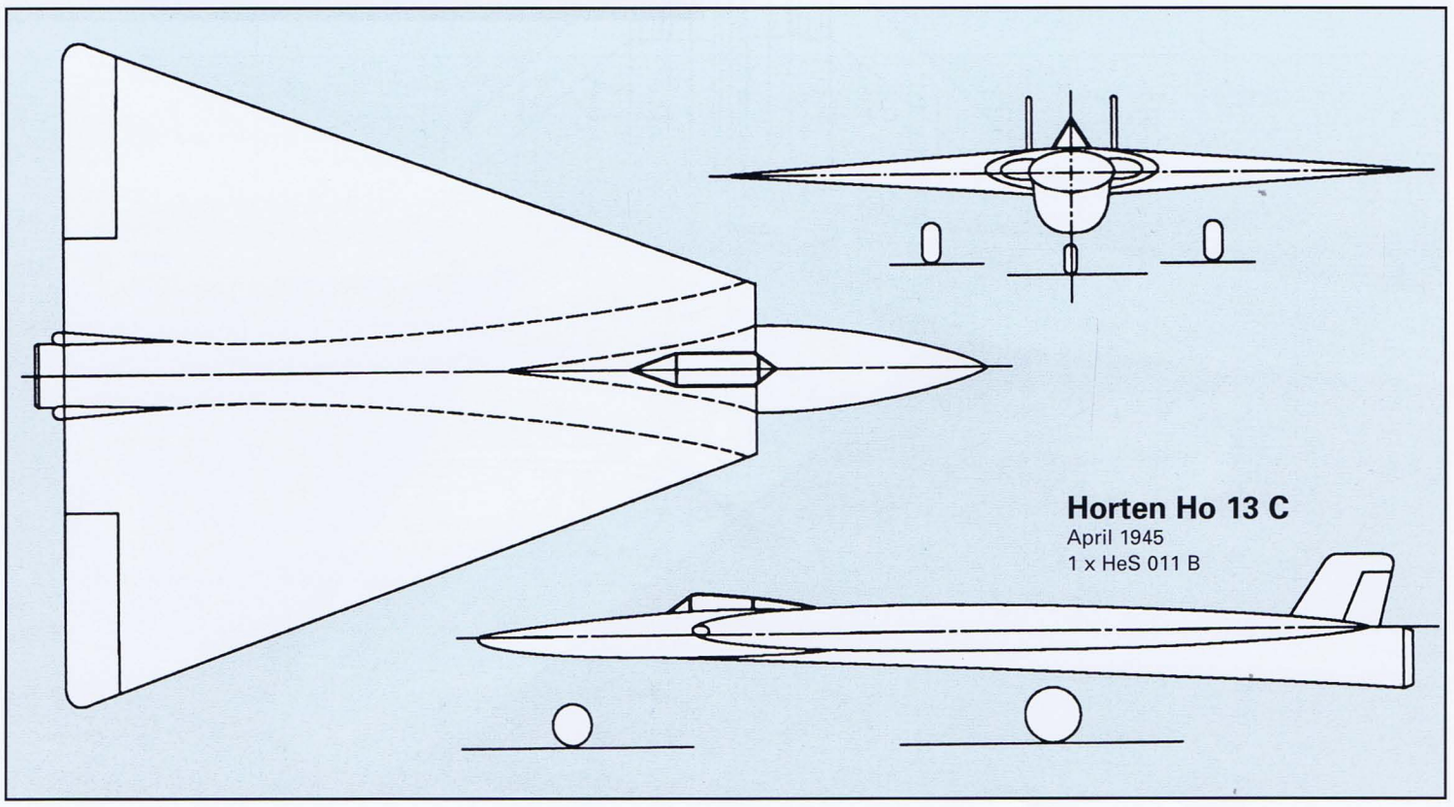
Above: With Horten test pilot Hermann Strebel at the controls, the Horten Ho 13 A is undergoing a test flight in January 1945. This sailplane, with its 60-degree swept wing, served as a testbed for the Horten 13 B jet fighter. The pilot was positioned in a gondola beneath the wing's rear center section. Note the regulation camouflage over the otherwise unmarked upper surface. **Right:** Close-up of the pilot's control gondola for the Ho 13 A. The pilot sat upright but his flight controls were suspended from overhead. Flying the Ho 13 A required considerable skill as the pilot's field of view was severely restricted. **Below:** This flight ended when Strebel misjudged his approach and overshot his landing. The aircraft is shown resting on top of the barbed wire parameter fence.

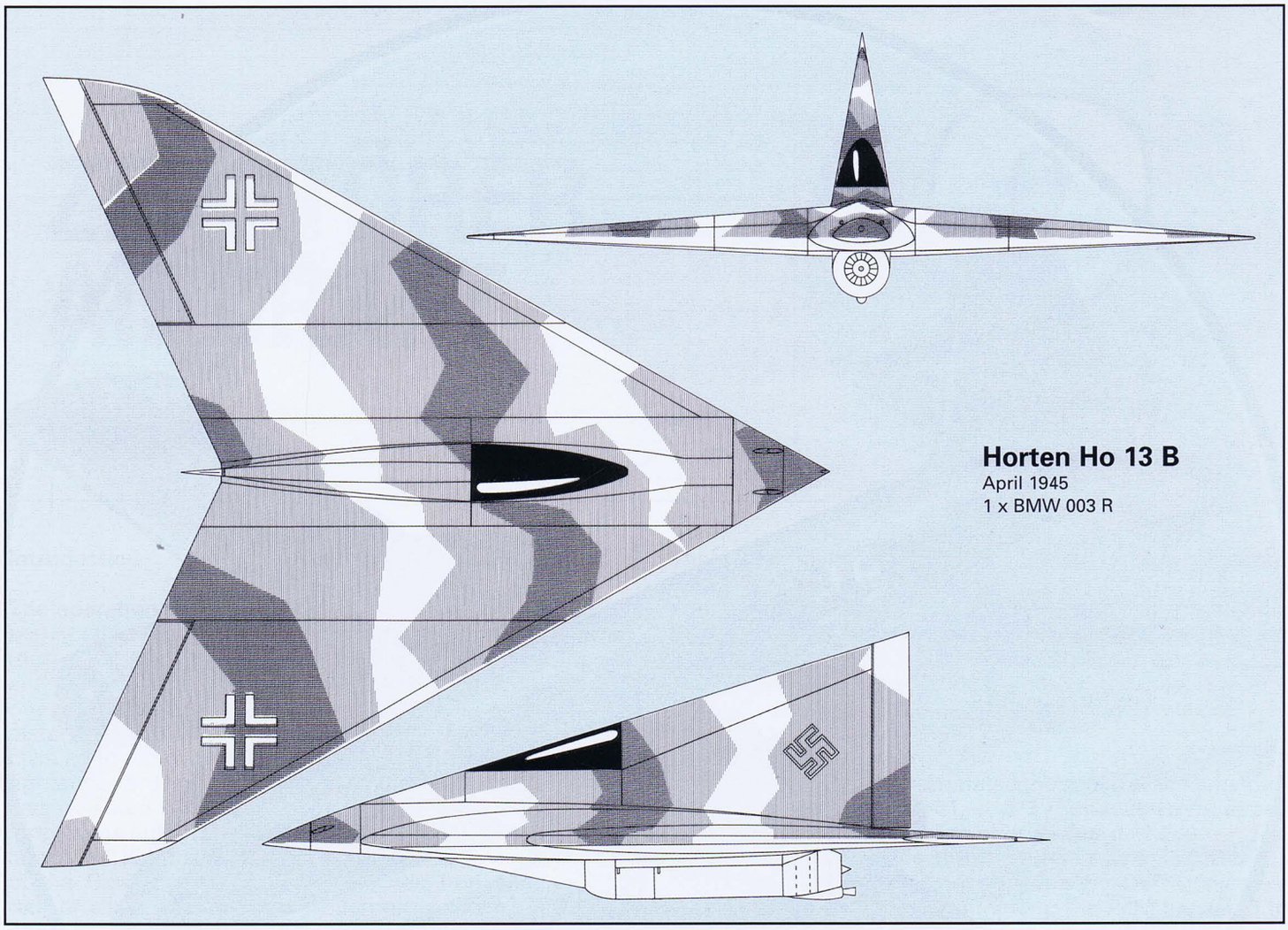




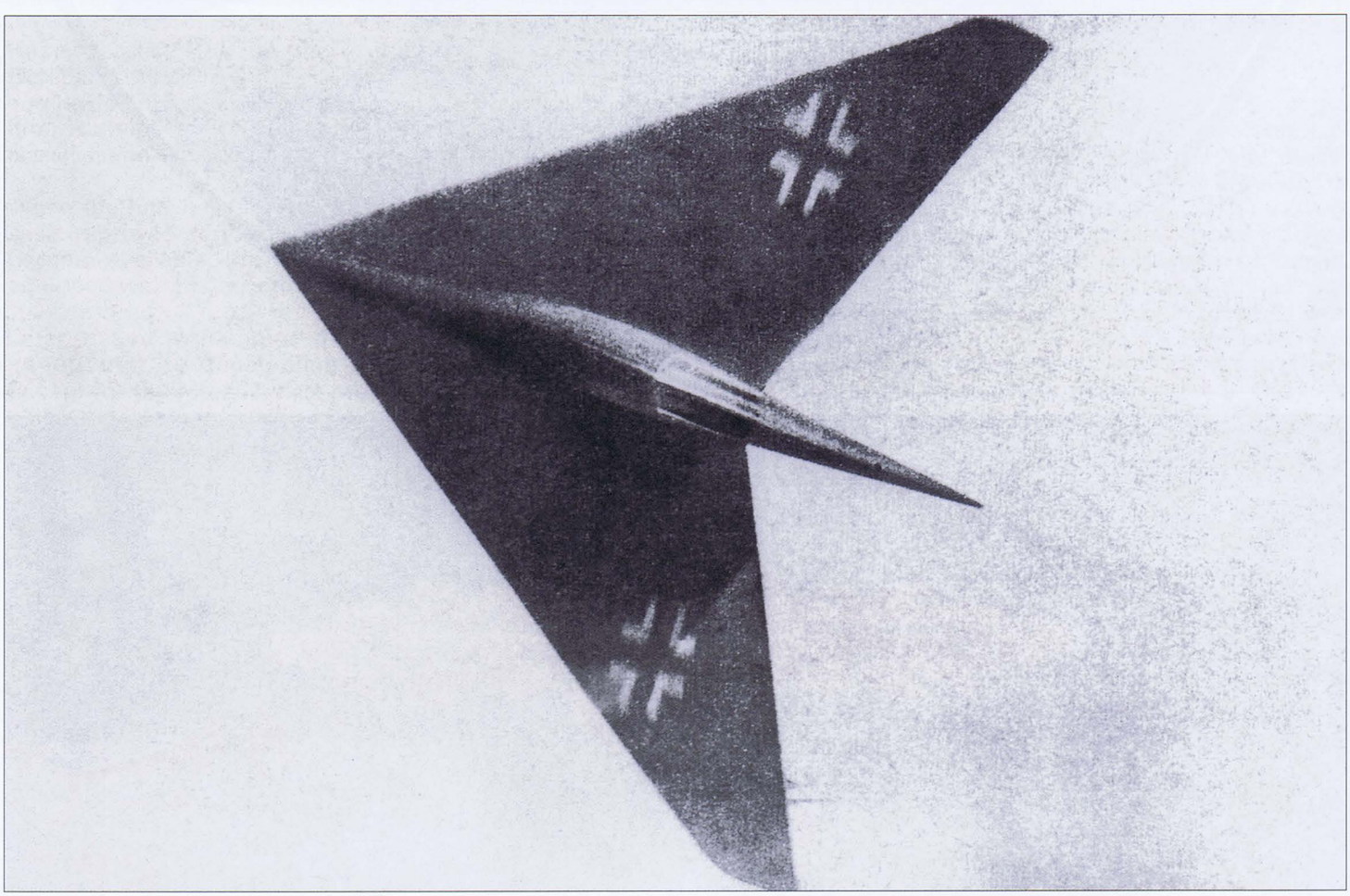
Above: An artist impression of the single-seat Horten Ho 10 project of 1944. The small all-wing fighter was to have been powered by a single HeS 011 turbojet and armed with up to three cannon. The Horten brothers unsuccessfully submitted the project in the Volksjäger competition of 1944.

Opposite right bottom: An impression of the proposed jet-powered Horten Ho 13 B for which the Ho 13 A (shown on p. 177) served as a flying test vehicle.





Horten Ho 13 B
April 1945
1 x BMW 003 R



ZERSTÖRER AIRCRAFT

2

Introduction

The operational career of the heavily armed twin-engined heavy attack day fighter, known in Germany as Zerstörer (destroyer), which were employed as antibomber aircraft and long-range fighters, ended with the so-called Blitzkrieg over western Europe. Powerful and heavily armed Allied piston-engine fighters prohibited the German Air Force from continuing the unrestricted use of their inferior heavy fighters and destroyers. The well-known Bf 110 Zerstörer was defeated by Merlin-powered Spitfires, P-47 and P-51 long-range fighters. The development of the Bf 110 and the later Me 210 and Me 410, failed to live up to expectations of the German High Command. Their horizontal speed, rate of climb, and tactical properties were insufficient to effectively compete with Allied piston-engine fighters.

Heavy losses, such as those sustained by ZG 76 on October 4, 1943, resulted in the withdrawal of most twin-engine destroyer units from the Reich and western Europe. Improvement of the full-performance spectrum of this classification thus became of major importance.

When the first reliable turbojet engines, which promised such improved performance in combat and emergencies, became available, the need for powerful heavy fighters equipped with the new turbojets was obvious.

Later, heavy twin-engine destroyers were designed in an attempt to reestablish German air superiority. Except for the Me 262, first proposed as a heavy fighter with an armament of six heavy caliber guns, no other design materialized before the unconditional surrender on May 8, 1945.

Mixed-propulsion Zerstörer Aircraft

The single-engine Blohm & Voss BV P 194 was an asymmetric multi-purpose design project intended for ground attack, dive-bombing, reconnaissance and Zerstörer duties broadly based on the firm's asymmetric BV 141 and BV 237 (see p. 18). The design was an asymmetrical midwing single-seat aircraft, powered by a BMW 801D piston engine in the nose of the main fuselage nacelle augmented by a Jumo 004 turbojet located in the rear of the starboard crew pod.

Opposite top: The multi-purpose Blohm & Voss BV P 203.01 was a mixed-propulsion Zerstörer project developed during June 1944. It was to be powered by two BMW 801s augmented by two HeS 011 mounted aft and below the radial engines.

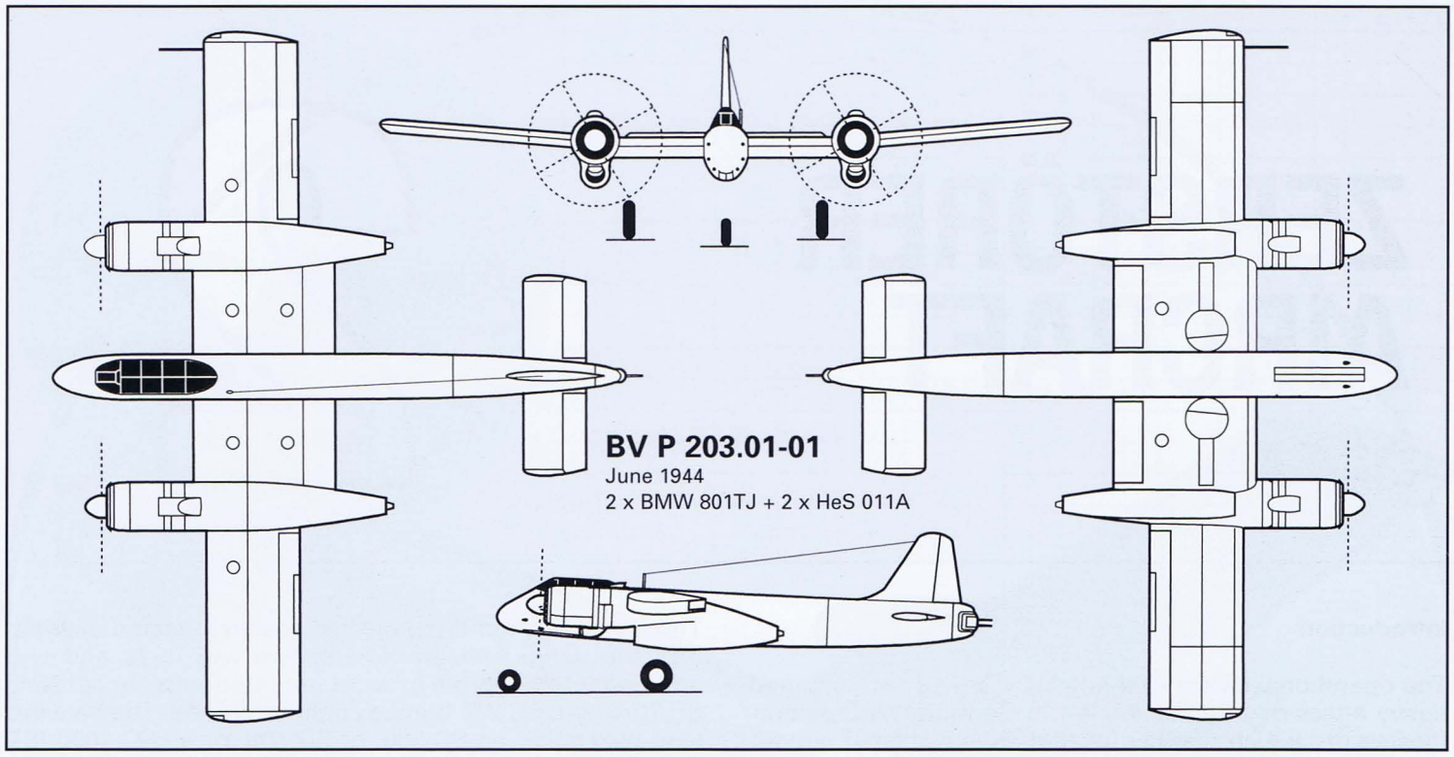
The mainwheels of the projected design retracted outward into the wings. All armament, two MG 151s and two additional MK 103 guns, were mounted inthe nose. Nine SC 70 or two SC 250 bombs could be carried. The heaviest load was either an SC 500, or SD 500, or an SC 1000 (SD 1000) resp. 1,100 lb and 2,200 lb bombs. The takeoff weight was 24,690 lb (11,200 kg), while the flying weight was estimated at 18,740 lb (8,500 kg).

The development team estimated the speed of the Zerstörer variant, the BV P 194.01-01, at 373 mph (600 km/h) at sea level, and 450 mph (725 km/h) at 23,620 ft (7,200 m). The calculated tactical range at this altitude was only 620 miles (1,000 km). Although Dr. Vogt's asymmetric BV 141 successfully fulfilled its design requirement, the RLM hesitated to accept the radical concept in combat aircraft. Not surprisingly, the design was abandoned in 1944, primarily because of its unorthodox layout.

Another heavy Zerstörer project that evolved in Dr. Vogt's design office during June 1944, was the conventional-appearing Blohm & Voss P 203. As with many earlier designs, this project was intended to fulfill a variety of roles. The first proposed version, the BV P 203.01-01, was designed as a general-purpose aircraft. Three different variants with alternative turbojet units were proposed. Besides the BV P 203.01-01 general-purpose model with two BMW 801TJs plus two HeS 011s, the BV P 203.02-01 with two BMW 801TJs and two Jumo 004s was advanced. The BV P 203.03-01, powered by two BMW 801TJs and two BMW 003 turbojets, were also considered.

The BMW 801TJ was among the most powerful examples of BMW radials with a supercharger incorporated in the engine with advanced fuel injection. The turbojets were to be placed under the rear engine nacelles, thus offering easy access. Two alternative engine installations were investigated. In one, the turbojets were underslung beneath the rear nacelles, but in the other version, the turbojets were elevated upward within the rear nacelle in line with the axis of the piston. In each case, the jet's air-intake was suspended beneath the nacelle with air directed either in line to the jet engine, or diverted upward and aft. The center wing section, between the nacelles and the fuselage, had an increased chord and thickness allowing for the housing of the mainwheels to the tricycle undercarriage.

• The official Blohm & Voss description for the P 203 gave a maximum takeoff weight of 40,565 lb (18,400 kg), including



one 2,200 lb SC 1000 bomb. Maximum range of the two-seat multi-role aircraft was approximately 1,550 miles (2,500 km), while the top speed at 39,370 ft (12,000 m) would have reached 572 mph (920 km/h).

Blohm & Voss engineers recognized that the combination of piston engines and turbojets had several advantages:

- It ensured the required performance, in particular the acceleration, of the Zerstörer.

- It improved endurance and made medium-range bomb raids possible.

- Range and endurance would increase in cruising flight on piston-engine power only,thus enabling its employment as a night fighter or Zerstörer.

The fixed forward-firing armament consisted of two MG 131s (400 rpg), two MG 151s (200 rpg), two additional MK 103s (100 rpg) and a remotely-controlled tail barbette with two MG 131s (400 rpg).

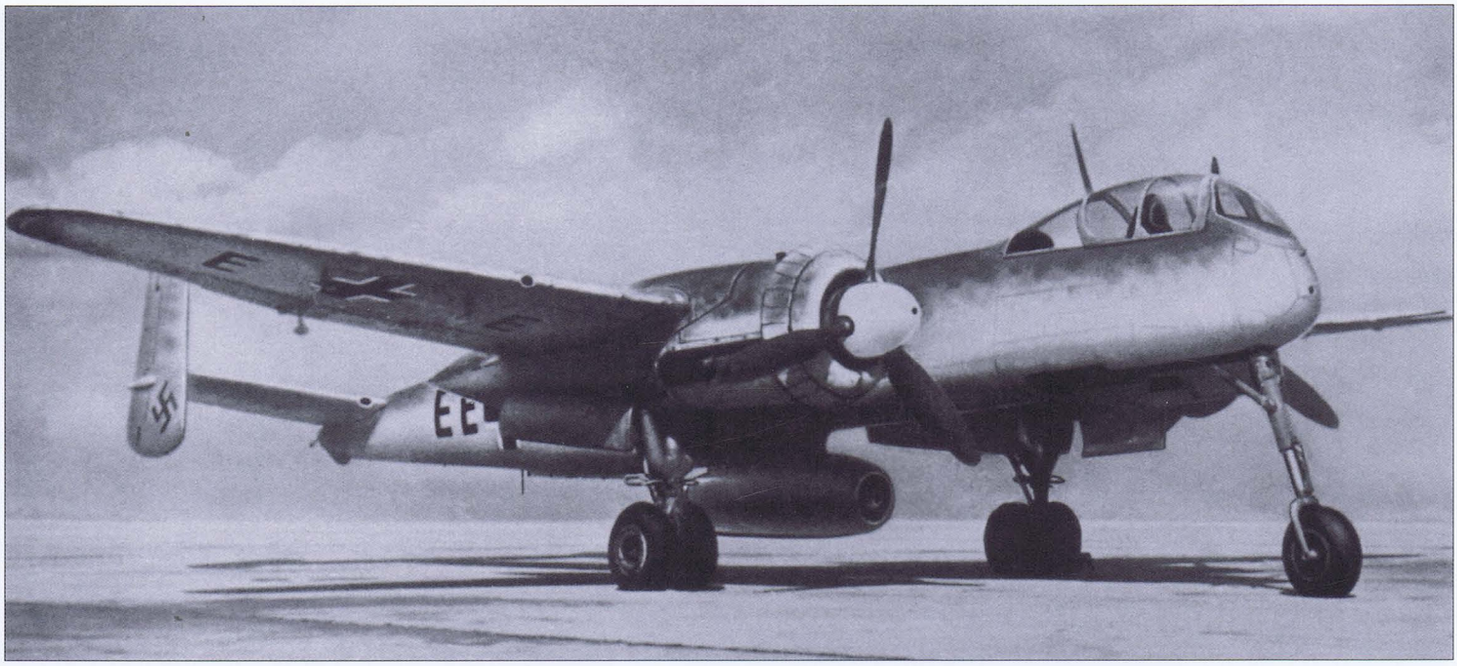
Unfortunately, the fuel system was extremely complicated, calling for two different fuels for the two different power-plants. After careful consideration, the RLM declined to favor Blohm & Voss with a development contract and, as in the BV P 194, the BV P 203 was also dropped.

In addition to the two Blohm & Voss projects, several other mixed-power designs were proposed by other German aircraft manufacturers. They were equipped with one or two additional turbojets considered essential for improving performance of most German combat aircraft. Among the early proposals was the Arado Ar 240 mit Turbinentriebwerk (with turbojet engine), a heavy twin-engine aircraft with an additional jet engine under the fuselage centerline. Arado engineers also advanced the Ar 440 mit Turbinentriebwerk. This aircraft was a development of the less successful Ar 240. Junkers, located at Dessau, also submitted proposals for mixed-power models of their highly successful Ju 88 and Ju 188, in which two Jumo 004B turbojets were to be installed under the inner wings. This arrangement made it all but impossible to carry underwing bomb loads. Additional unacceptable problems were the complicated fuel system for the different engine types, and the requisite separate tanks.

Heinkel proposed a turbojet mounted beneath the fuselage of their large He 219 night fighter. An experimental test aircraft, the He 219 A-010 became available for this installation during mid-September 1943, and the flight test program began on September 30, 1943. By November 11, 1943, fourteen flights had been made, during one of which a speed of 339 mph (545 km/h) at sea level was attained. Two days later, the He 219 A-010TL was damaged when it crashed at Aspern, near Vienna, a result of the BMW turbojet flaming out in flight. When restarting the engine, a large tongue of flame appeared from the jet, causing the crew to believe their aircraft was on fire. When both piston engines inexplicably failed a few minutes later, the pilot decided to make an emergency landing. The resulting landing damage could not be easily repaired, and it was decided on February 2, 1944, to modify a second test aircraft. This aircraft, the He 219 V30, W.Nr.190101, was to be transferred to Erprobungsstelle Rechlin within the next few months for further flight tests, but by April nothing further had been accomplished, except the redesign of the weapons bay with two MK 103 machine cannons. Simultaneously development of a Jumo 222-powered He 219 was moving forward, although this potentially powerful piston engine had many problems that were never completely resolved. Therefore, further work of the He 219 TL was terminated in the summer of 1944 by order of the Air Ministry.

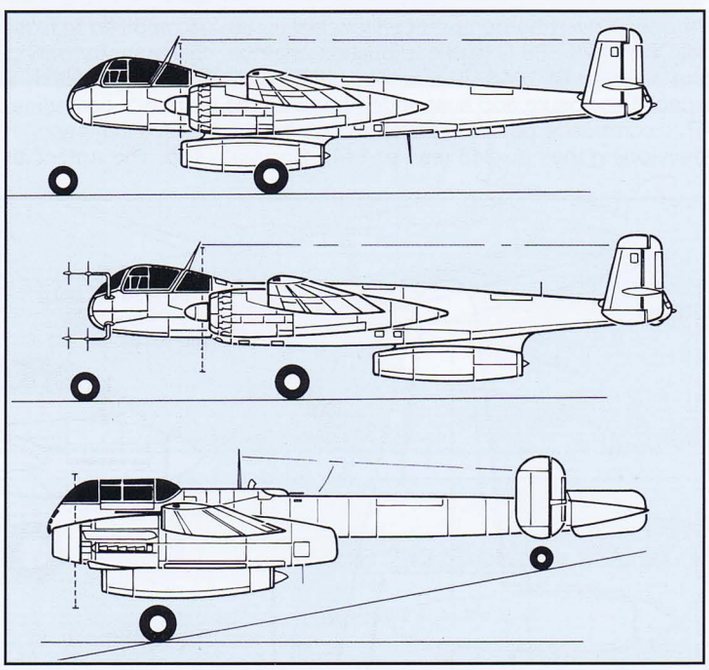
Jet and Turboprop-powered Zerstörer Aircraft

Several design studies were proposed by the Arado company, under designations Ar TL 1500, 2000, and 3000 Zerstörer. These aircraft were similar in design to the original bomber variants, but differed in layout and installation of the turbojet units. Development of these projects was restricted by a lack of suitably powerful turbojet engines. A turboprop-powered heavy fighter, the Ar PTL Zerstörer proposed in late 1943, would have had a takeoff weight of

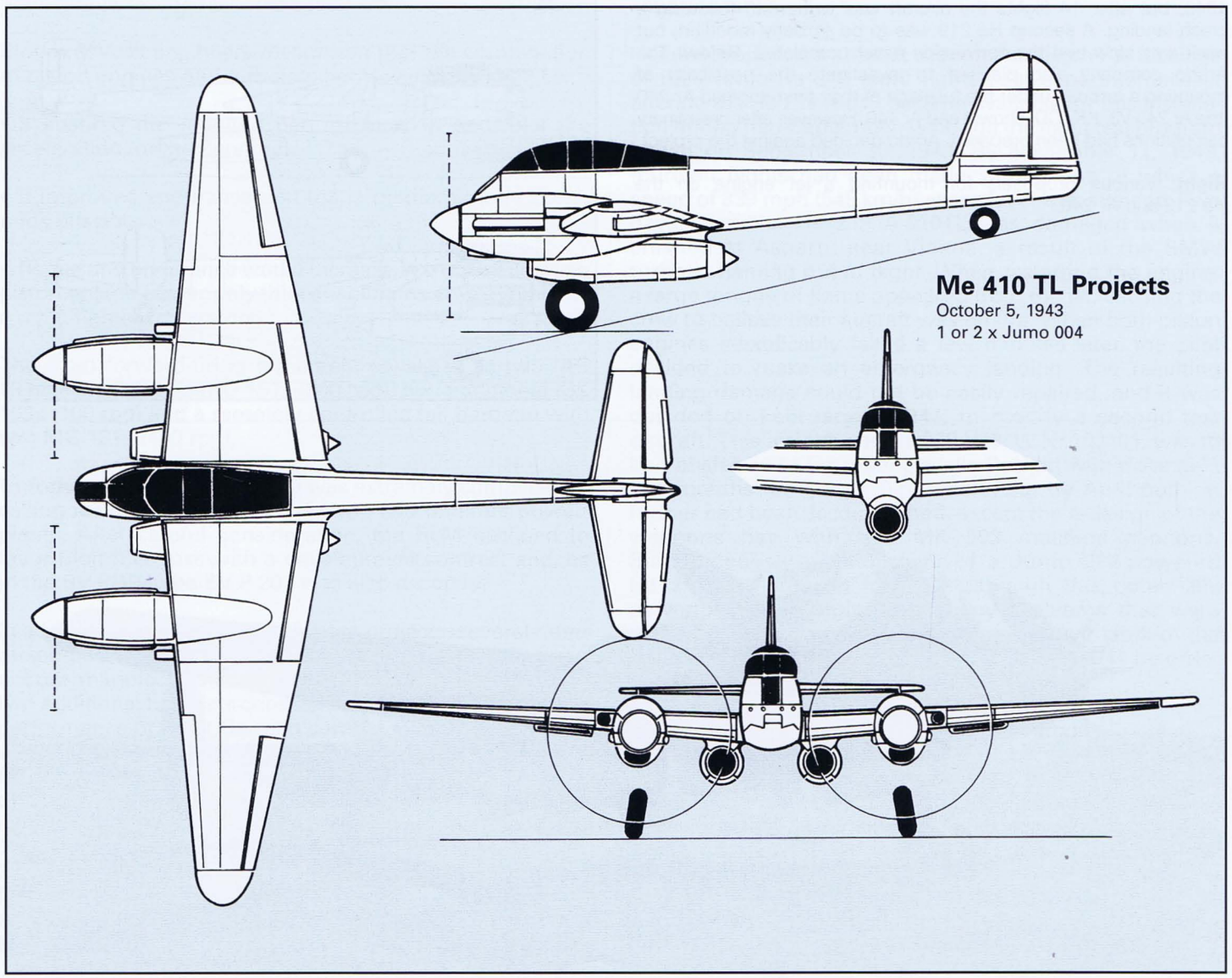


Above: Only one He 219 was adapted to test the feasibility of mounting a single BMW 003 turbojet beneath the fuselage. Unfortunately, no photographs of this aircraft are known to exist, and we are left with this convincing photo retouch. The talented German artist, Gert W. Heumann has air brushed a jet engine over a postwar photograph of a captured He 219. Heinkel began testing the He 219 A-101 fitted with an early BMW 003 late in September 1943, but after 14 flights the aircraft was written-off following a crash landing. A second He 219 was to be similarly modified, but work was slow and the conversion never completed. **Below:** The Arado company also planned to investigate the possibility of mounting a turbojet under the fuselage of their twin-engined Ar 240 (the Ar 240 V3, KK+CD, shown) and Ar 440. However, after preliminary calculations had been prepared, Arado decided against the project.

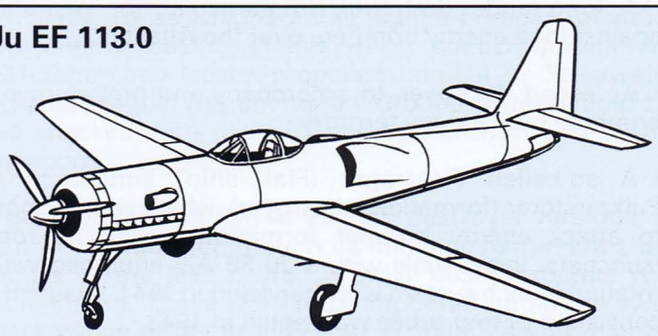
Right: Various proposals for mounting a jet engine on the He 219 and Ar 240.



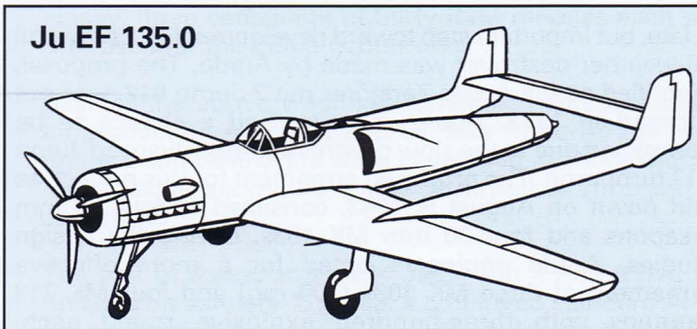
Above: A rare photograph of a standard Ju 88 A-4 modified to flight test the HWK 509 C twin combustion chamber rocket motor during the summer of 1944. In this view, the rocket is encased within a special enclosure and suspended beneath the bomber's centerline. This composite power installation was to aid Junkers engineers in developing their Ju 248 (see p. 144). **Opposite top:** The American Convair XF-81, c/n 44-91000, successfully flew with mixed power using a Packard V-1650-7 Merlin in the nose and an Allison J33-GE-5 gas turbine in the rear. Later, the Merlin was removed and a General Electric XT-31 turboprop was installed in the nose (shown in this view). The XP-81 was America's first turboprop aircraft flying with this engine for the first time on December 21, 1945.

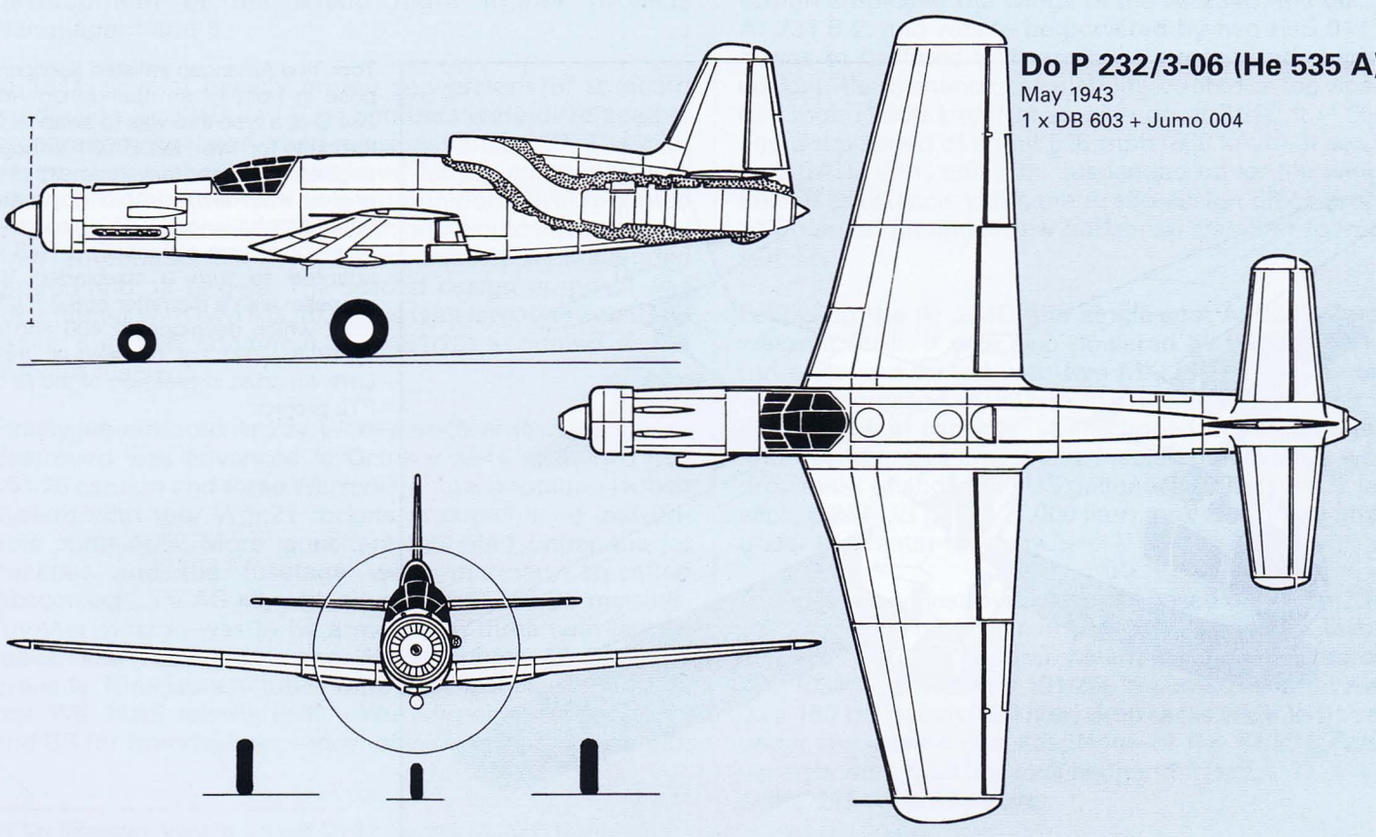


Ju EF 113.0

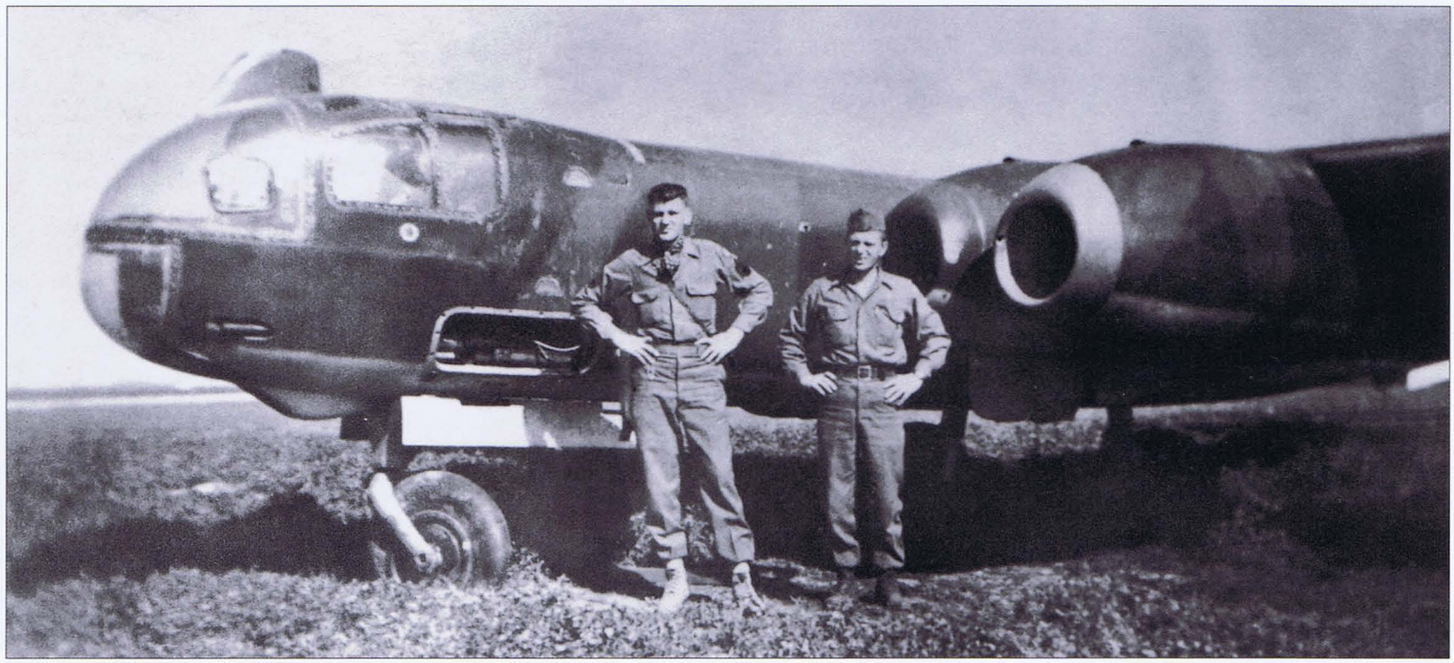


Ju EF 135.0





Do P 232/3-06 (He 535 A)
May 1943
1 x DB 603 + Jumo 004



74,295 lb (33,700 kg). Work on this project was abandoned because it appeared impossible to finalize design of turboprop engines in Germany.

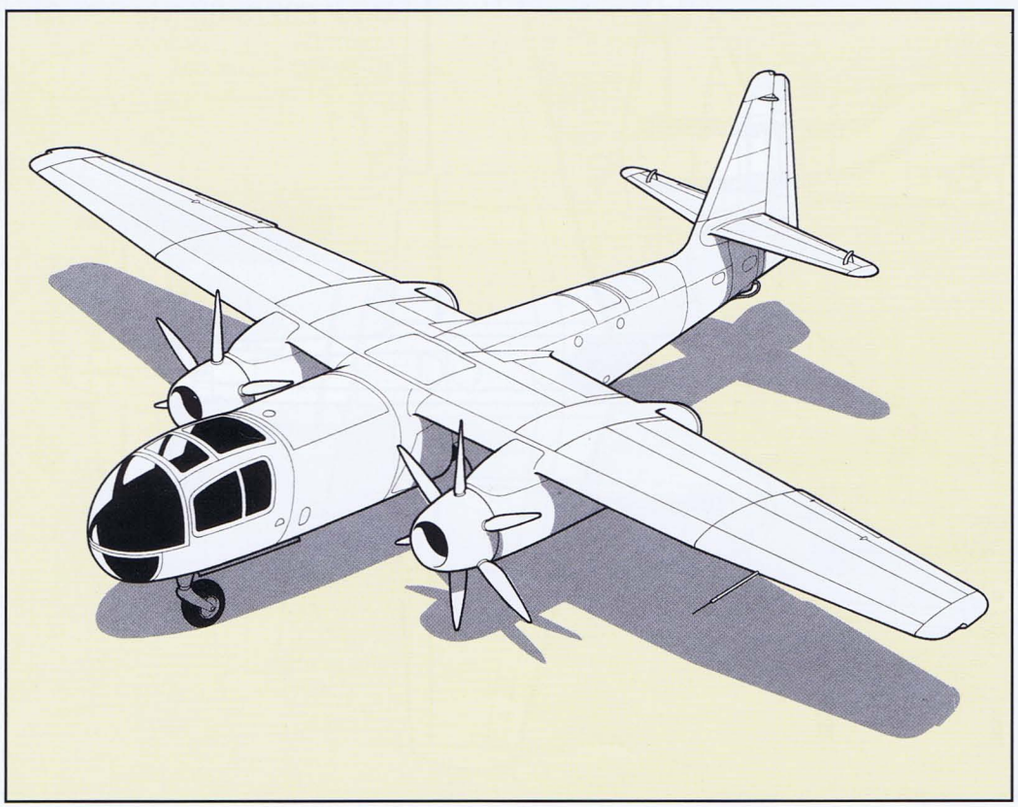
A late, but important step toward development of a powerful all-weather destroyer was made by Arado. The proposal, identified as the Arado Zerstörer mit 2 Jumo 012, was put forward in 1943. Again, it never had a chance to be completed due to the slow progress of the advanced Jumo 012 turboprop. The proposed armament for this project, as laid down on August 8, 1943, consisted of four 20 mm weapons and four 30 mm MK 103s. During the design studies, Arado engineers opted for a more effective armament of three MK 103s (100 rpg) and four MK 213 cannons with three-hundred explosive round each. Additionally, a tail armament of two MK 213s was provided.

In consideration of the heavy armament, Arado proposed four different roles for this design:

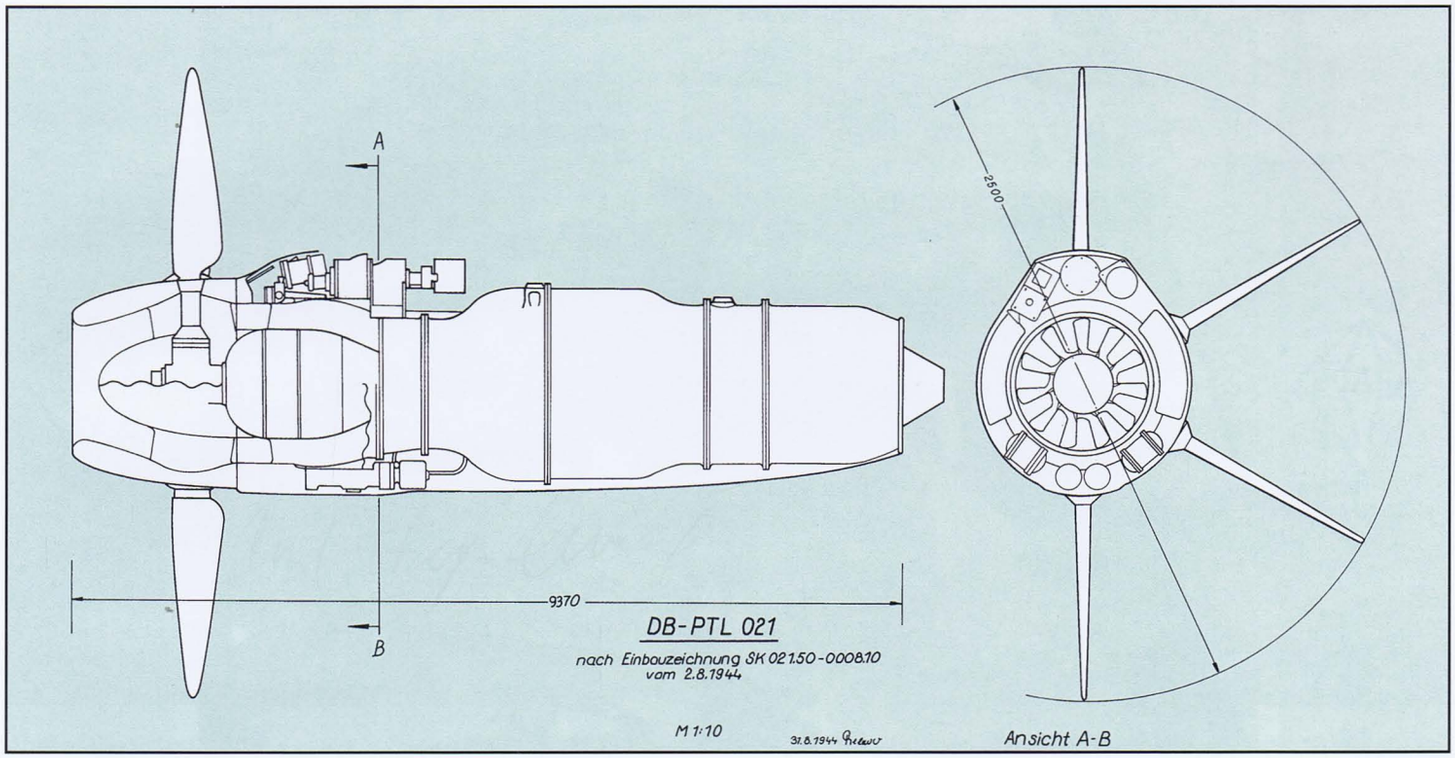
• A long-range destroyer, in particular for operations against lone enemy bombers over the Atlantic.

• An escort destroyer, to accompany and protect own jet bombers over enemy territory.

• A so-called Flakträger (Flak ship) similar to the Pulkzerstörer (formations destroyer), which was supposed to attack enemy bomber formations using its rocket launchers. Initial trials with a Ju 88 A-5 equipped with a rotating launch system were canceled in 1944; a launch set consisting of four tubes was tested in 1943.



Top: Two American enlisted servicemen pose in front of an abandoned Arado 234 C-3, a type that was to swap its four turbojets for two He/DB 021 turboprop engines. However, development of this engine was neither rapid nor without difficult challenges. This advanced powerplant was essentially a HeS 011 adapted to turn a six-bladed VDM propeller with a diameter of 8.2 ft (2500 mm), which developed 2,400 ehp and 1,742 lb (790 kg) of residual thrust. **Left:** An artist impression of the Ar 234 PTL project.



• Finally, use as a Jagdbomber (fighter-bomber) for attacks on enemy positions and troop concentrations with Schubbomben (rocket-propelled bombs) or Streuwaffen (cluster bombs) was envisaged. Ground targets would also be attacked with five of the seven 20 mm and 30 mm weapons.

For further developed Ar TL 1500 destroyer versions, the Jumo 012 turbojet, then in its initial development stage, or six of the less powerful BMW 003A turbojets were considered. These were to be mounted under the swept back wings of the modified Ar TL 1500 Zerstörer. In late 1944, the results of the research became important in the development of the Arado night fighter projects Nachtjäger I and II.

In 1944, several heavily armed conversions of standard production Ar 234B and C jet bombers were developed in preparation for later multi-mission versions.[31] The first design was that of a streamlined fairing containing two heavy MK 103 guns with two ammunition tanks mounted under all production Ar 234 aircraft and would have enabled them to conduct effective attacks against well-defended ground and air targets. The second design proposal was for a fighter with two MK 103 guns with larger ammunition tanks, and two additional MG 151/20s mounted in the forward fuselage.

Finally, an armored Ar 234 Werferzerstörer (missile-armed destroyer) was advanced in October 1944, with two MG 151/20 cannon and three Werfervierlinge, a rotating launch system with four Wgr.21 rockets in streamlined jettisonable containers. More launchers mounted under the jet nacelles and the fuselage were planned, so-called Abschussgeräte AG 40, with six or nine R 100 BS missiles. Another version was to be armed with three twin launch tubes, each containing one Werfergranate 42 launcher grenade. Nine launch- tubes were to be installed, each with one WK 14BS missile (WK – Wurfkörper mortar missile, and BS for Brandsplitter – incendiary fragmentation shell).

Finally, three containers of thirty R4M missiles each were proposed for the Pulkzerstörer role.

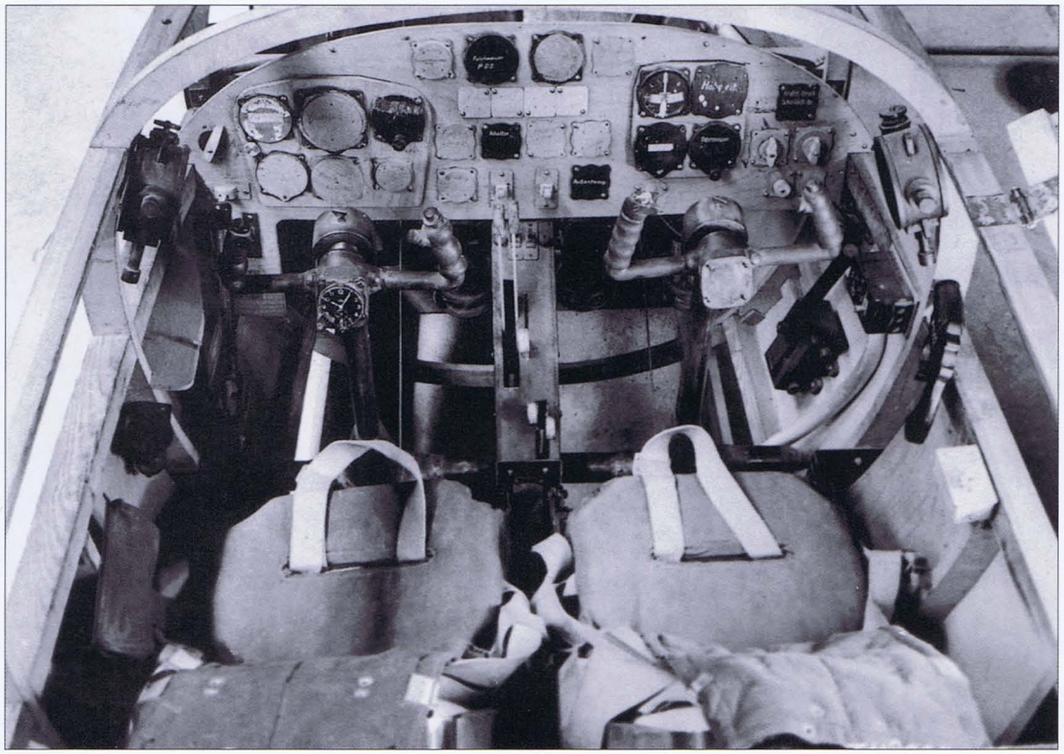
Besides the above weapons conversion sets included in all production Ar 234Bs and Cs, four more Ar 234 heavy fighters and destroyers were developed at Landeshut and immediately submitted to the Technisches Amt and the Jägerstab.

The first of these, an Ar 234 Jäger mit 2 HeS 011A, was finished on January 12, 1943. It employed standard Ar 234 B-2 production fuselage and wings. By March 15, 1944, an MK 103-armed Ar 234D Zerstörer had been evaluated, the design employed the wings of the Ar 234C, the tail of the Ar 234 B-2, and was to be powered by two HeS 011 A-1s. It was to be fitted with armored, pressurized single-seat cockpit. Performance calculations quoted a top speed of 621 mph (1,000 km/h) at an altitude of 3,280 ft (1,000 m), and a top speed of about 528 mph (850 km/h) at sea level. Two RATO units could be suspended under the wings for takeoff assistance. Later, the Arado design office proposed an enlarged fin and a new horizontal stabilizer to improve stability.

Following the Ar 234D, the single-seat Ar 234E Zerstörer was put forth. It was also powered by two HeS 011 B-1 turbojets and armed with two MK 103 guns. The takeoff weight increased to 22,635 lb (10,280 kg) because of an increased fuel capacity, strengthened undercarriage, and improved passive armament. Instead of two large wooden drop tanks of about 160 US gallons (600 liters) of J2 jet fuel each, a 264 US gallon (1,000 liter) tank was firmly attached under the center fuselage.

The last heavy destroyer, that was based on the Ar 234 C-3, but propelled by a pair of powerful Jumo 012 turbojets, was the Ar 234F Zerstörer. Its armament consisted of two MK 103s and two MG 151/20s mounted in the fuselage. Two 160 US gallon (600 liter) drop tanks were to be carried under the engine nacelles. None of the Ar 234 Zerstörer variants were built because neither the HeS 011A/B nor the Jumo 012 were available.

31 See Monogram Monarch-1, *Arado 234 Blitz,* by Smith & Creek, Monogram Aviation Publications, Boylston, MA 1992.



Above: Of the two-seat Arado Ar 234 D-1, only wind tunnel models and this full size wooden mockup of the cabin were completed by early 1945. The Zerstörer equivalent, the Ar 234 E, would have been similar but equipped with heavy caliber forward-firing weapons.

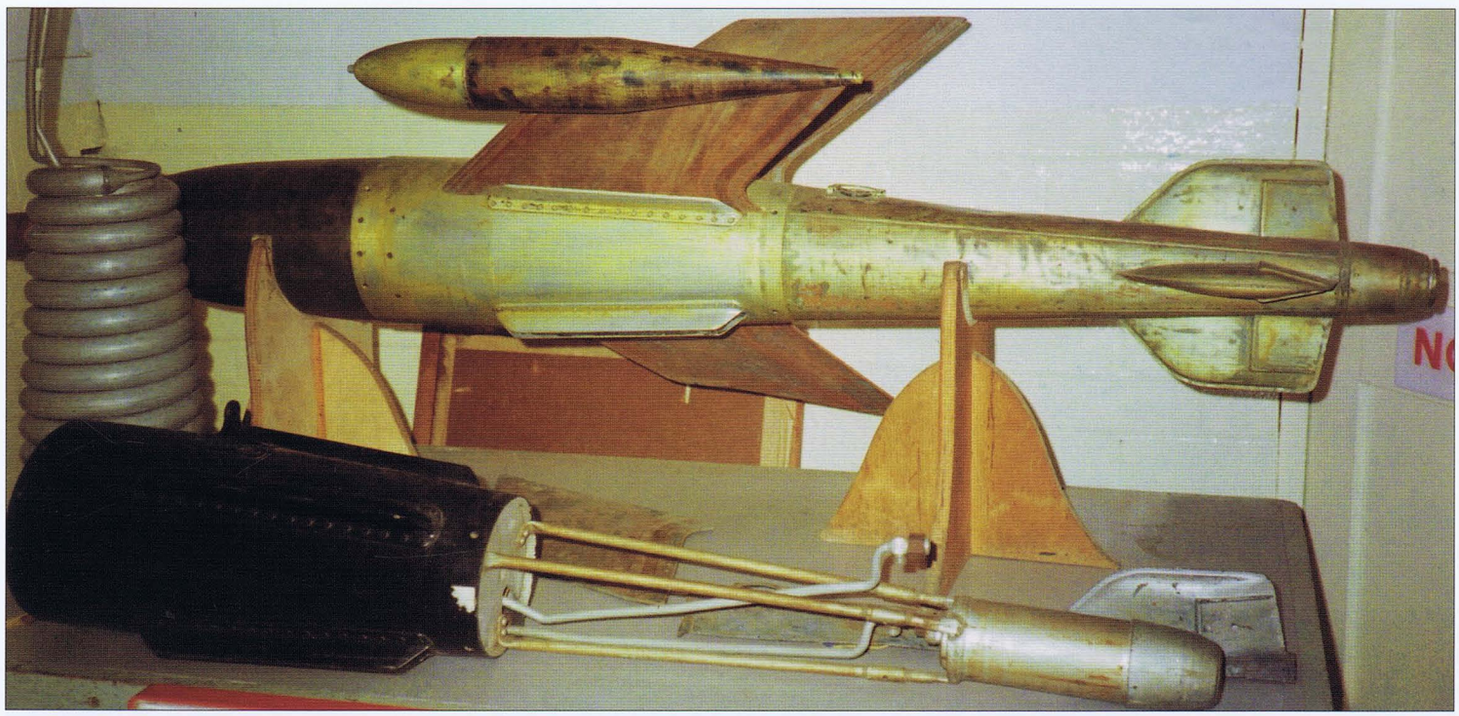
The improved performance of enemy aircraft gave rise to a further modification of the Ar 234 B-2, later designated Ar 234 Höhenjäger and Höhenzerstörer (high-altitude fighter and destroyer), that differed according to the weapons system installed. Two versions were developed, one carrying four 20 mm MG 151 cannon, while the other was armed with two MG 151/20s and two MK 103s. The airframe of both designs was similar to that of the Ar 234C, but they were fitted with an armored pressurized cockpit. It was generally accepted that guns of a minimum caliber of 20 mm were needed for successful attacks on, and the destruction of, high-flying intruders, bombers and fighters. Arado therefore investigated the installation of two so-called Magirusbomben or containers with two MG 151/20s each having a total of 400 rounds, under the engine nacelles. It was further proposed to carry two 79 US gallons (300 liters) drop tanks under the twin nacelles. To protect pilot and aircraft, the vulnerable front section was well armored against enemy fire. Both versions had a maximum takeoff weight of about 23,150 lb (10,500 kg), and were equipped with an automatic pilot of the K12 type. The radio equipment consisted of FuGs 15, 25a, 136, and 217. Performance calculations, finished in March 1944, gave the following details of the fighter aircraft: the maximum range was approximately 1,118 miles (1,800 km). The range would drop to about 808 miles (1,300 km) at a speed of 522 mph (840 km/h) at an altitude of 32,800 ft (10,000 m). At the time, the RLM estimated the average speed of British jet fighters would not exceed 520 mph (835 km/h), and therefore abandoned development in the summer of 1944.

The Dornier Company developed its piston-engined Do 335 to fulfill several roles, including a Zerstörer model, and also actively sought to adapt the aircraft to the mixed-propulsion configuration.[32] Their Do P 232/3, which was to be developed and produced by Heinkel as the Heinkel He 535A, featured a standard Do 335 modified to incorporate a new tail assembly built around a Jumo 004. In spite of its promise, neither Dornier nor Heinkel had the resources to complete this project before the end of the war.

Two interesting design studies from Junkers that failed to be developed are worthy of mention. The Ju EF 113.0 and Ju EF 135.0 were similar but distinct. Both were mixed-power Zerstörers that featured a piston engine in the nose (Jumo 213) plus a rear-mounted turbojet whose air intakes were two scoops positioned on the fuselage just aft of the cockpit.

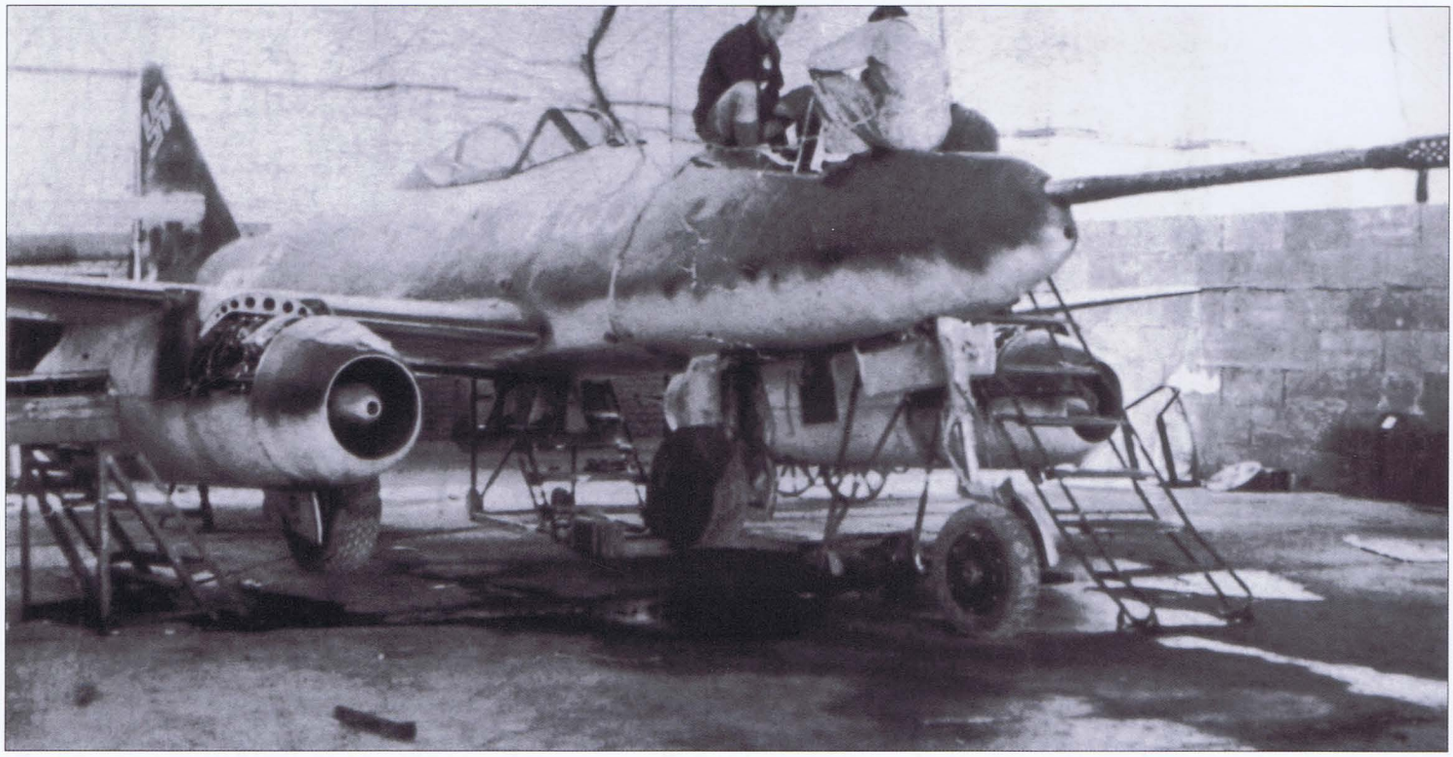
In March 1945, the development of the Messerschmitt Me Zerstörer I and II began at Oberammergau, without regard to the course of the war. Some documents described the design as Zerstörer mit T-Leitwerk (destroyer with T-tail). Very little data survived the destruction and looting of Messerschmitt's Oberammergau facilities carried out by displaced persons (DPs) from an Allied-controlled DP camp near Oberammergau that had difficulty restricting movement of the detainees. Thus, only a limited number of important documents were actually retrieved by US intelligence officers.

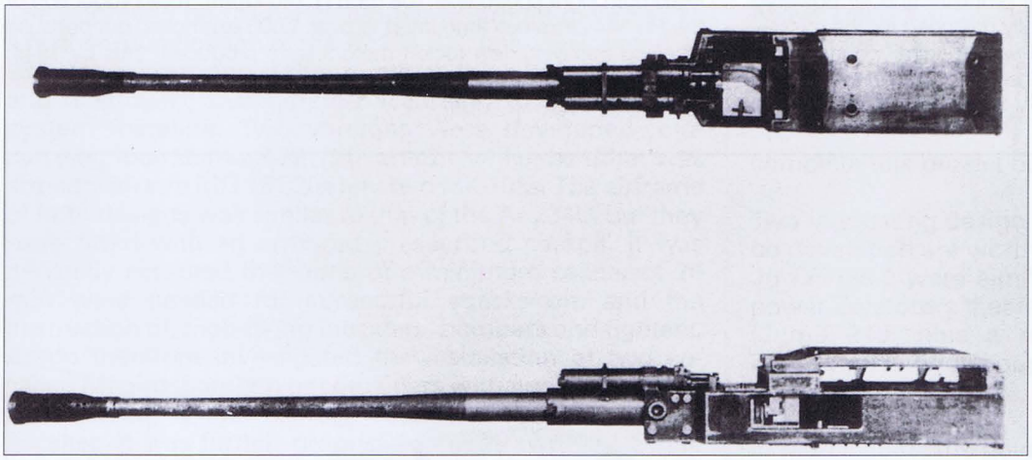
32 See Monogram Monarch-2, *Dornier 335 Arrow,* by Smith, Creek & Hitchcock, Monogram Avaition Publications, Boylston, MA 1997.



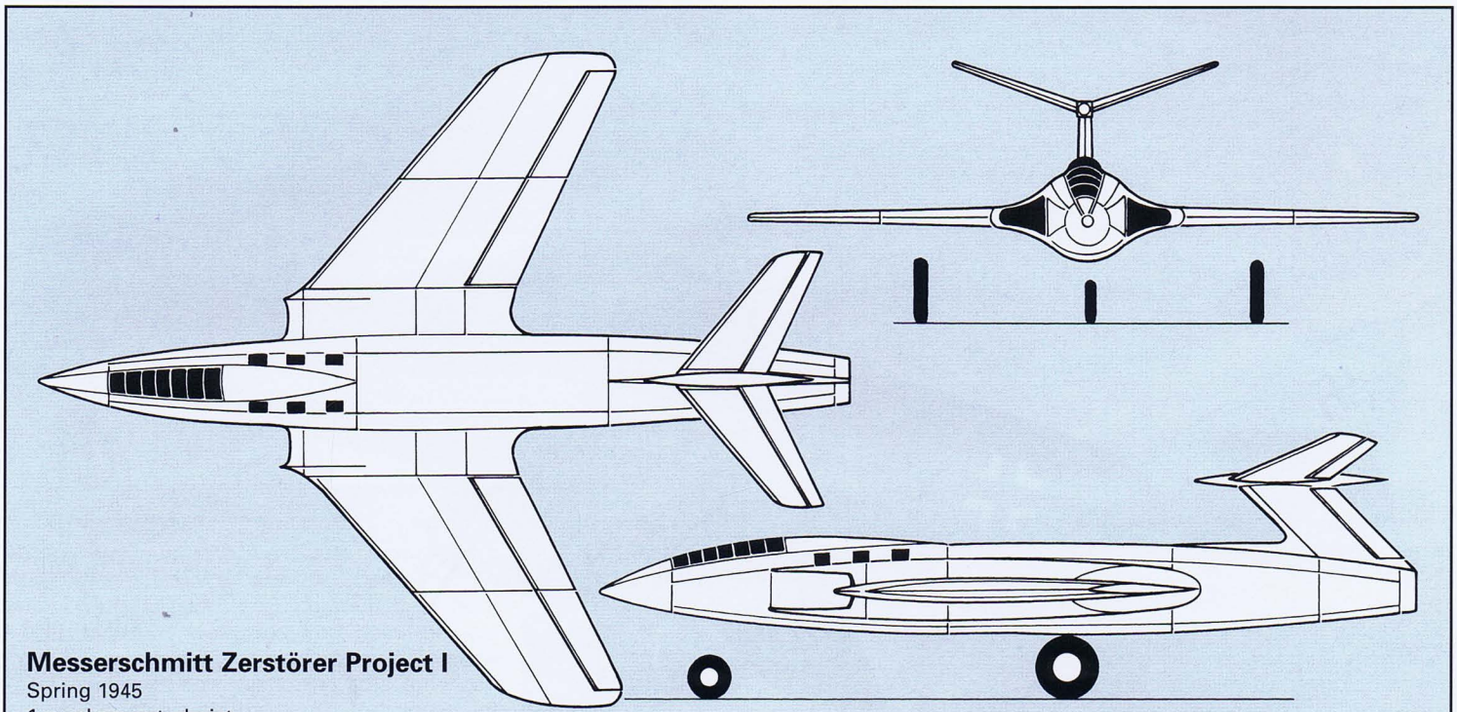
Above: The Ruhrstahl Ru 344 (later known as the X 4) air-to-air missile developed late in 1944, for use with both propeller and jet powered fighters, was powered by a rocket especially designed for the missile, the BMW 548. The fuels were contained with a spiral wound tubes housed within the missile (far left). The inner spiral contained R-Stoff (Tonka 250) while the outer spiral held SV-Stoff (Salbei). The overall length was 6.5 ft (2000 mm) and fueled weight was 132 lb (60 kg). Maximum flight speed was 708 mph (1,140 km/h). Total production of the Ru 344 airframes amounted to over 1,000 examples, but because of Allied bombing, few rocket motors were produced, thus by 1945, plans to operationally use the missile failed to be realized.

Me 262 A-1a/ 8-344
Spring 1945
4 x Ru 344 (X 4) rockets

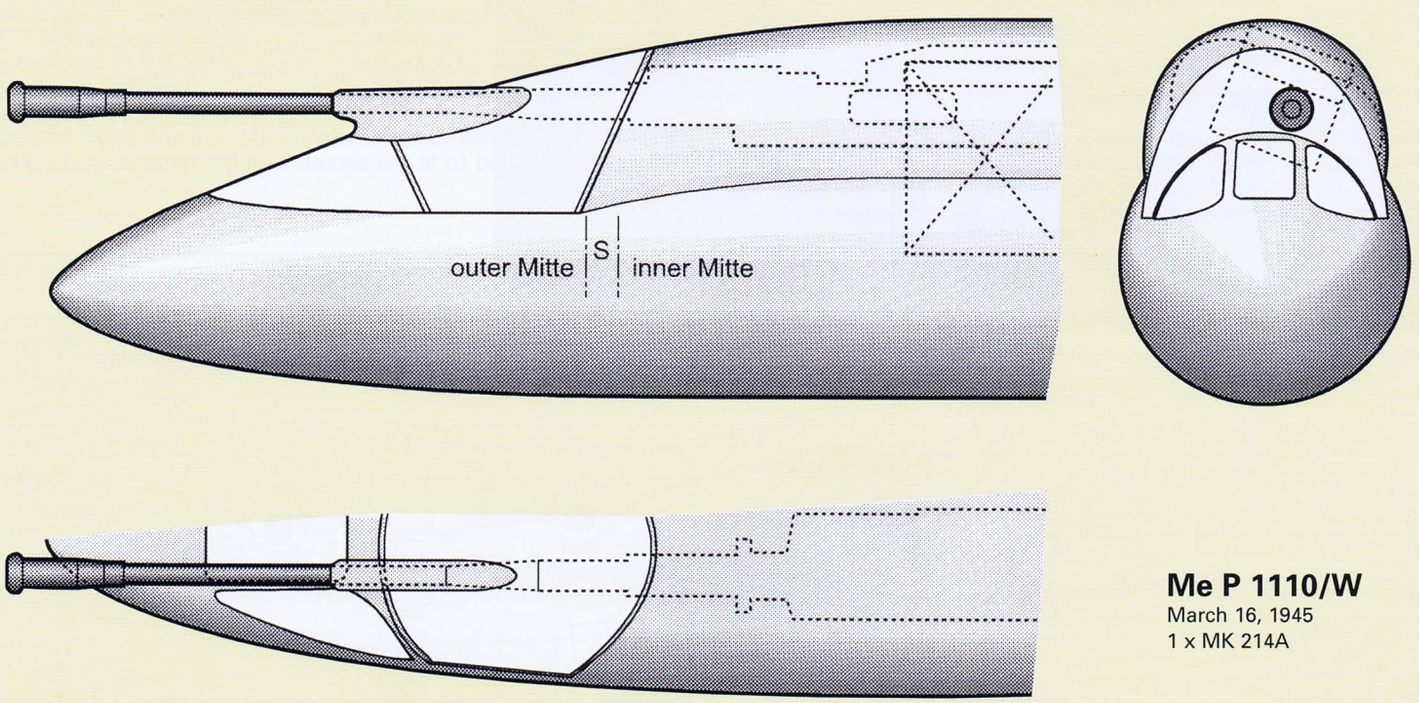




Left: The Mauser MK 214 A was originally an anti-tank cannon but converted as a heavy aircraft cannon of 50 mm caliber . It had an overall length of 13.1 ft (4,0 m), a barrel length of 9.2 ft (2.82 m), and a rate-of-fire of 160 rounds per minute. **Above and below:** The Me 262 A-1a/U4 was fitted with the MK 214 A. Two examples of this conversion were completed and flown (see p. 64, 65) before the end of the war.

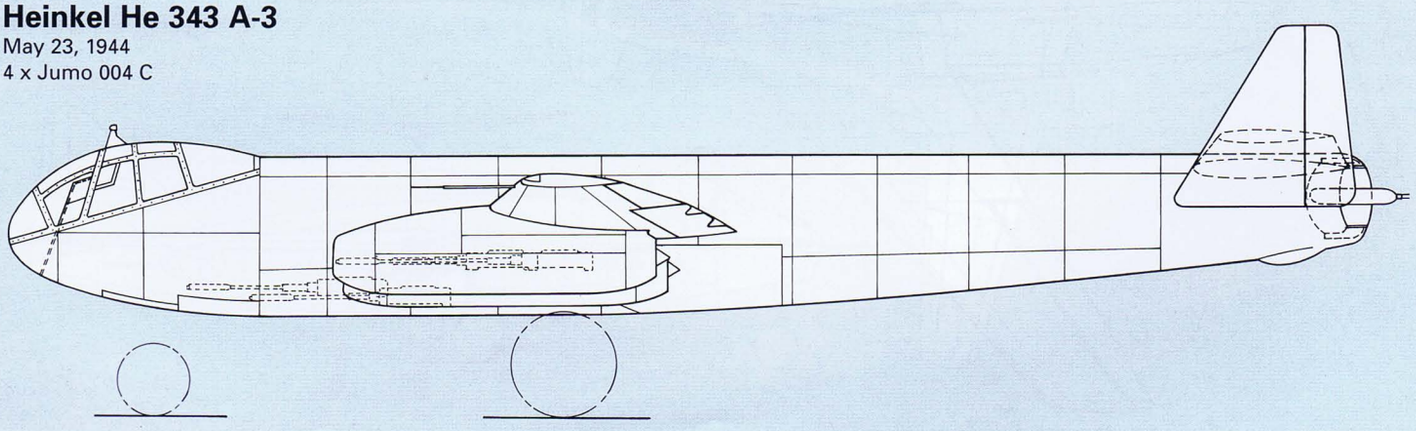


Messerschmitt Zerstörer Project I
Spring 1945
1 x unknown turbojet

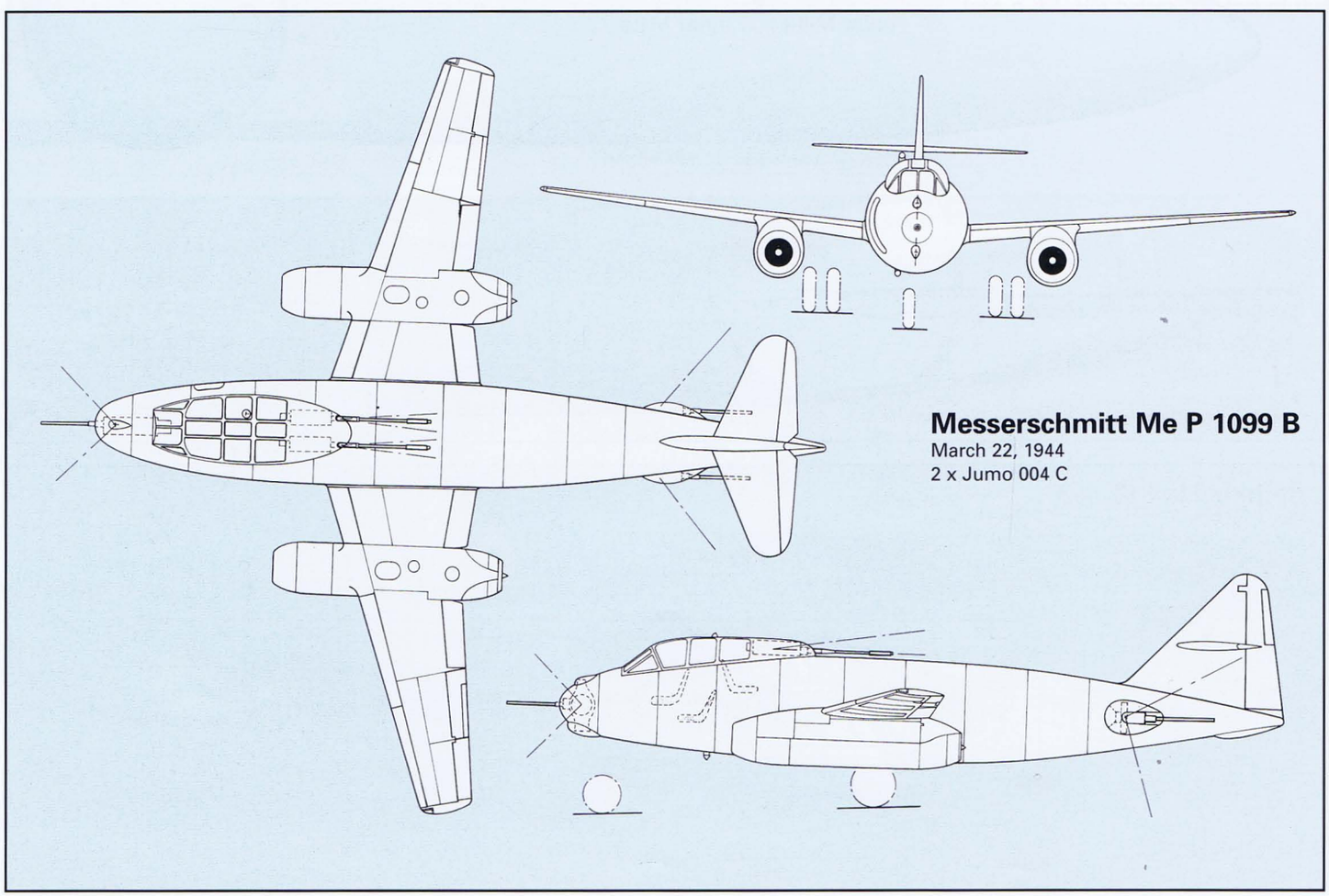


Me P 1110/W
March 16, 1945
1 x MK 214A

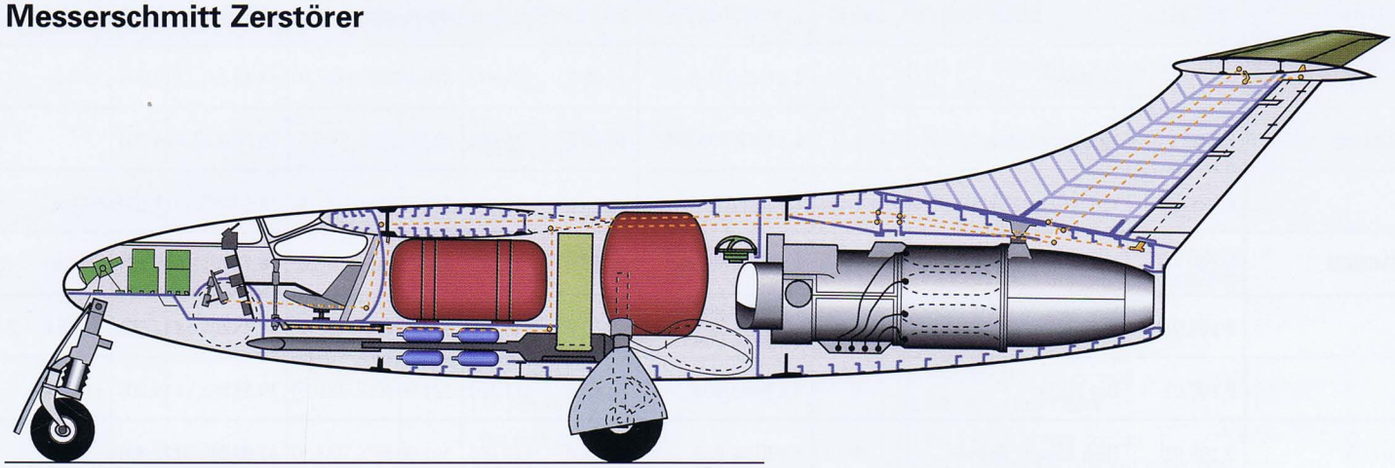
Heinkel He 343 A-3
May 23, 1944
4 x Jumo 004 C



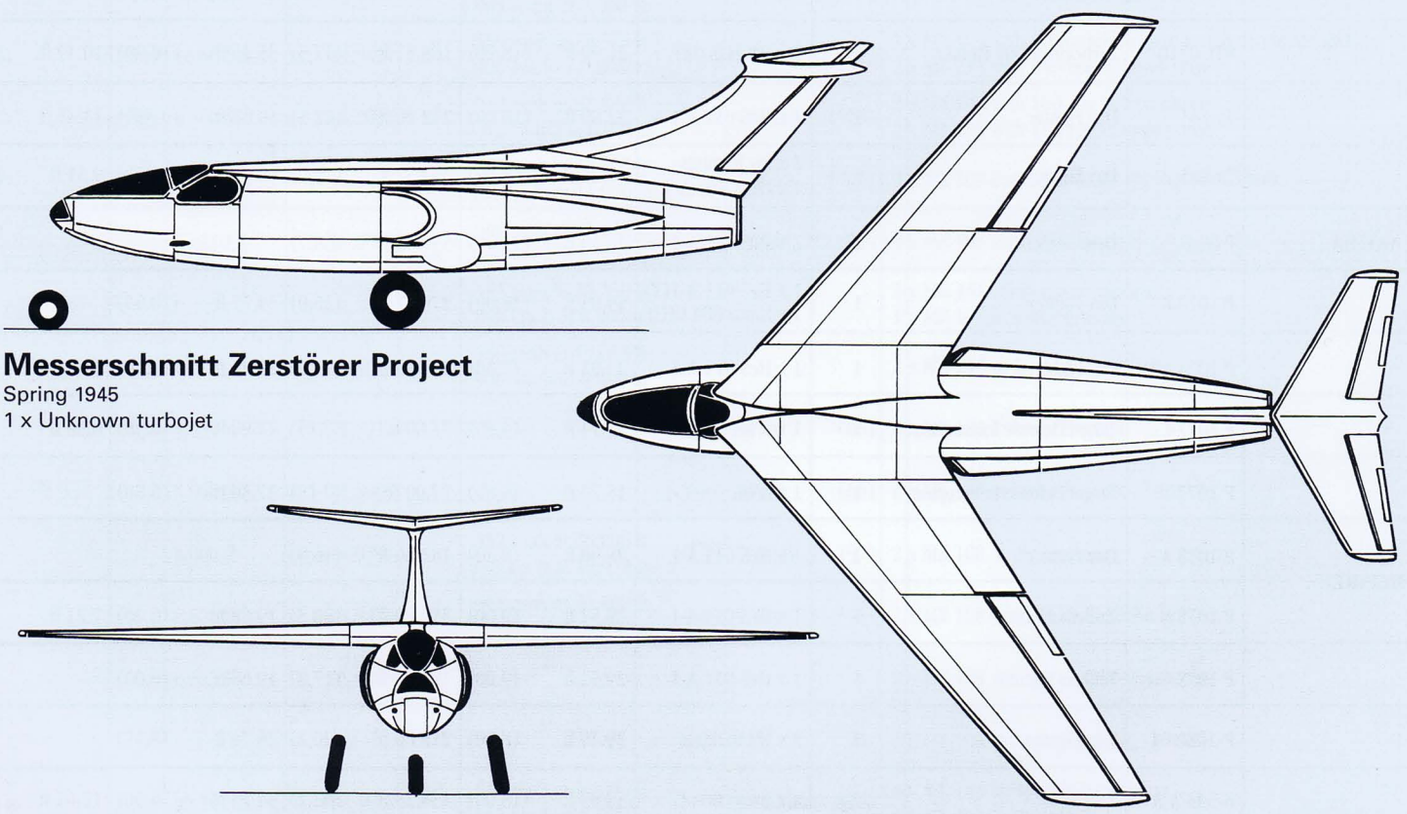
Above: Keith Woodcock's striking impression of the Me P 1099 B heavy fighter based on Messerschmitt drawing XVIII/85 dated March 22, 1944. Employing Me 262 wings and tailplane, this Zerstörer project would have been decidedly heavier than the standard Me 262 thanks to its heavy armament and larger fuselage. It was also planned to fit the aircraft with the more powerful Jumo 004 C turbojets.



Messerschmitt Zerstörer



Right: Surrounded by dense woods, the Messerschmitt design offices at Oberammergau were well shielded and camouflaged from observation. So well protected from the war were these facilities, that research and development continued right up to the time American troops appeared at the doors. Advanced jet projects, such as the unusual shoulder wing Zerstörer shown on this page, continued to be designed and developed. After the war, inmates from a nearby Displaced Person (DP) camp set upon the Messerschmitt facility, looting and destroying it before being driven off. It has never been established how many documents and records were lost during this period.



Messerschmitt Zerstörer Project

Spring 1945
1 x Unknown turbojet

PROJECT SPECIFICATIONS, WEIGHTS

COMPANY	PROJECT	ROLE	CREW	ENGINE(S)	WING SPAN (m)	WING AREA (m²)	LENGTH (m)	HEIGHT (m)
ARADO	8-234E	Zerstörer	1	2 x HeS 011 A	47.28 ft (14,41)	290.69 ft² (27,0)	42.13 ft (12,84)	13.6 ft (4,15)
	E 381	Miniature Fighter	1	1 x HWK 501 B-1	16.40 ft (5,00)	59.20 ft² (5,5)	18.70 ft (5,70)	
	E 581-4	Tailless Day Fighter	1	1 x HeS 011 A-1	29.36 ft (8,95)	242.20 ft² (22,5)	18.53 ft (5,65)	8.53 ft (2,60)
BACHEM	8-349 A-1	Rocket Interceptor	1	1 x HWK 509 A-2	11.81 ft (3,60)	38.75 ft² (3,6)	18.77 ft (5,72)	7.22 ft (2,20)
BLOHM & VOSS	P 194.01	Zerstörer	1	1 x BMW 801 D 1 x Jumo 004 C	50.20 ft (15,30)	392.01 ft² (3,64)	38.55 ft (11,75)	12.86 ft (3,92)
	P 197.01	Day Fighter	1	2 x Jumo 004	36.42 ft (11,10)	221.00 ft² (20,5)	29.53 ft (9,00)	11.94 ft (3,64)
	P 198.01	High Altitude Fighter	1	1 x BMW 018	49.21 ft (15,00)	361.00 ft² (33,5)	41.99 ft (12,80)	
	P 202.01	Variable Wing Day Fighter	1	2 x BMW 003 A-1	39.30 ft (11,98)	215.00 ft² (19,9)		
	P 203.02	Zerstörer	2	2 x BMW 801 TJ 2 x Jumo 004	65.62 ft (20,00)	699.67 ft² (65,0)	54.46 ft (16,60)	
	P 209.01	Scissors Tail Day Fighter	1	1 x HeS 011 A-1	34.94 ft (10,65)	139.93 ft² (13,0)	28.80 ft (8,78)	11.09 ft (3,38)
	P 210.01	Scissors Tail Day Fighter	1	1 x BMW 003 A-1	37.80 ft (11,52)	161.01 ft² (14,9)	24.08 ft (7,34)	
	P 211.02	Volkjäger	1	1 x BMW 003 A-1	24.93 ft (7,60)	138.53 ft² (12,8)	26.44 ft (8,06)	10.82 ft (3,30)
	P 212.02	Scissors Tail Day Fighter		11 x HeS 011 A-1	31.16 ft (9,50)	150.69 ft² (14,0)	24.27 ft (7,40)	9.02 ft (2,75)
	P 213.01	Miniature Fighter	1	1 x As 014	19.68 ft (6,00)	53.82 ft² (5,0)	20.34 ft (6,20)	7.48 ft (2,28)
FOCKE-WULF	8-226	Day Fighter	1	1 x HeS 011 A-1	26.25 ft (8,00)	150.69 ft² (14,0)	34.61 ft (10,55)	7.70 ft (2,35)
	TL P.2	Day Fighter	1	1 x Jumo 004	31.82 ft (9,70)	161.46 ft² (15,0)	32.31 ft (9,85)	14.10 ft (4,30)
	8-250	Day Fighter	1	2 x BMW 011				
	8-252	Day Fighter	1	1 x HeS 011 A-1	31.16 ft (9,50)	215.28 ft² (20,0)	29.85 ft (9,10)	11.98 ft (3,65)
	PTL 0310	Turboprop Day Fighter	1	1 x DB/HeS 021	26.90 ft (8,20)	188.37 ft² (17,5)	35.43 ft (10,80)	10.17 ft (3,10)
	Ta 183	Day Fighter	1	1 x HeS 011 A-1	32.80 ft (10,00)	242.20 ft² (22,5)	30.67 ft (9,350)	11.41 ft (3,48)
	Ta 283	Day Fighter	1	2 x Fw Ramjets 1 x HWK 501 A-1	26.24 ft (8,00)	204.52 ft² (19,0)	38.87 ft (11,850)	9.51 ft (2,90)
GOTHA	P 60 B	Delta Fighter	2	2 x HeS 011 A-1	44.29 ft (13,50)	590.95 ft² (54,7)		
HEINKEL	P 1073.8	Day Fighter	1	1 x HeS 011 A-1 (T) 1 x Jumo 004 C(U)	59.05 ft (18,00)	279.87 ft² (26,0)	34.77 ft (10,60)	
	P 1073.13	Day Fighter	1	1 x HeS 011 A-1	24.93 ft (7,60)	139.93 ft² (13,0)	28.21 ft (8,60)	
	P 1077-I	Target Defense Interceptor	1	1 x HWK 509 C-1	15.74 ft (4,80)	77.00 ft² (7,15)	22.90 ft (6,98)	6.56 ft (2,00)
	P 1077-II	Target Defense Interceptor	1	1 x HWK 509 C-1	15.74 ft (4,80)	77.00 ft² (7,15)	22.30 ft (6,80)	
	P 1078 A	Day Fighter	1	1 x HeS 011 A-1	28.90 ft (8,80)	182.00 ft² (16,9)		
	P 1078 B	Tailless Fighter	1	1 x HeS 011 A-1	29.52 ft (9,00)	219.00 ft² (20,3)	19.68 ft (6,00)	7.21 ft (2,20)
	P 1078 C	Tailless Fighter	1	1 x HeS 011 A-1	29.52 ft (9,00)	191.60 ft² (17,8)	19.68 ft (6,00)	
	P-1080.01	Day Fighter	1	2 x He Ramjets	29.20 ft (8,90)	218.00 ft² (20,2)	26.74 ft (8,15)	
	8-343 A-3	Zerstörer	2	4 x Jumo 004 C	59.05 ft (18,00)	454.25 ft² (42,2)	54.13 ft (16,50)	17.61 ft (5,37)
	8-535 A-1	Zerstörer	1	1 x DB 603 LA 1 x HeS 011 A-1	44.3 ft (13,5)		42.9 ft (13,1)	18.4 ft (5,60)

AND ESTIMATED PERFORMANCE STATISTICS

WEIGHT EMPTY (kg)	WEIGHT EQUIP. (kg)	MAX. SPEED AT ALTITUDE	RANGE (km)	ARMAMENT
14,528 lb (6,590)	23,501 lb (10,660)			2 x MK 103 mounted in a detachable pod under the fuselage 2 x MG 151/20 mounted in the lower nose section
	3,307 lb (1,500)	559 mph at 26,247 ft 900km/h at 8,000 m		1 x MK 108 with 45 rounds mounted above fuselage
4,508 lb (2,045)	6,298 lb (2,857)			2 x MK 108 in wing roots
1,763 lb (800)	4,519 lb (2,050)	621 mph to max. altitude 52,493 ft 1,000 km/h to max. altitude 16,000 m	34 mi (55,0)	32 x 55 mm R4M air-to-air rockets in nose, or 24 x 73 mm Föhn air-to-air rockets in nose
16,700 lb (7,575)	21,200 lb (9,616)	428 mph at 22,600 ft 688 km/h at 6,888 m	655 mi (1,054)	2 x MG 151/20 in nose 2 x MK 103 in nose
	12,850 lb (5,828)	660 mph at 27,000 ft 1,062 km/h at 8,230 m		2 x MG 151/20 in upper nose 2 x MK 103 in lower nose
	16,000 lb (7,258)	530 mph at 44,300 ft 850 km/h at 13,500 m	900 mi (1,448)	2 x MG 151/20 in nose section 1 x MK 412 centrally mounted under pilot
		545 mph at 11,500 ft 877 km/h at 3,505 m		1 x MK 103 in lower center of nose 2 x MG 151/20 in lower nose
27,293 lb (12,380)	40,321 lb (18,290)	570 mph at 39,000 ft 917 km/h at 11,887 m		2 x MG 131 with 400 rpg in nose 2 x MK 103 with 100 rpg in nose 2 x MG 151 with 200 rpg in nose + 1 x MG 131Z with 400 rpg in tail
	5,511 lb (2,500)	615 mph at 32,800 ft 990 km/h at 10,000 m	578 mi (930)	2 x MK 108 cannon in nose with 70 rpg
				2 x MK 151/20 or 2 x MK 108 mounted in the lower nose section
5,467 lb (2,480)	7,495 lb (3,400)	476 mph at 19,685 ft 767 km/h at 6,000 m	342 mi (550)	2 x MK 108 with 60 rpg in nose
	8,850 lb (4,014)	640 mph at 29,500 ft 1,029 km/h at 8,991 m	700 mi (1,126)	2 x MK 108 with 100 rpg in nose 1 x MK 108 with 100 rpg in nose center
2,821 lb (1,280)		403 mph at 19,685 ft 650 km/h at 6,000 m	106 mi (170)	1 x MK 108 in the center of the nose
6,019 lb (2,730)	8,046 lb (3,650)	605 mph at 30,839 ft 975 km/h at 9,400 m	310 mi (500)	2 x MK 103 with 80 rpg in lower nose 2 x MK 108 with 60 rpg in the wings
5,313 lb (2,410)	7,385 lb (3,350)	513 mph at 19,685 ft 825 km/h at 6,000 m	264 mi (425)	2 x MG 151/20 with 175 rpg in wing roots 2 x MK 108 with 70 rpg in lower nose
		538 mph at 36,000 ft 865 km/h at 11,000 m		2 x MK 108 with 120 rpg in the upper nose 2 x MK 213 with 180 rpg in the lower nose
(2,730)	9,143 lb (4,150)	600 mph at 22,966 ft 965 km/h at 7,000 m	559 mi (900)	2 x MK 108 with 100 rpg in nose
7,486 lb (3,396)	10,802 lb (4,900)	559 mph at 29,528 ft 900 km/h at 9,000 m	634 mi (1,020)	1 x MK 103 with 60 rounds firing through propeller shaft 2 x MK 213 with 240 rpg in lower nose
6,225 lb (2,824)	9,460 lb (4,291)	632 mph at 22,880 ft 1,017 km/h at 6,974 m	602 mi (969)	2 x MK 108 with 100 rpg in lower nose 2 x MK 108 with 120 rpg in upper nose
8,818 lb (4,000)	11,905 lb (5,400)	593 mph at 35,600 ft 955 km/h at 11,000 m	435 mi (700)	2 x MK 103 cannon with 60 rpg in nose section
	24,250 lb (11,000)	609 mph at 26,250 ft 980 km/h at 8,000 m	932 mi (1,400)	4 x MK 108 cannon in the wing center section
		553 mph at 26,250 ft 890 km/h at 8,000 m		2 x MG 151/20 in lower fuselage 1 x MK 103 in lower fuselage
		559 mph at 19,685 ft 900 km/h at 6,000 m		2 x MG 213 in lower nose
	3,950 lb (1,791)		41 mi (66)	2 x MK 108 in lower fuselage
	3,968 lb (1,800)		41 mi (66)	2 x MK 108 in lower fuselage
	8,900 lb (4,037)	552 mph at 36,000 ft 888 km/h at 10,972 m	930 mi (1,497)	2 x MK 108 in the fuselage
	8,570 lb (3,887)	565 mph at 36,000 ft 909 km/h at 10,972 m	960 mi (1,545)	2 x MK 108 in starboard nacelle
	8,643 lb (3,920)			2 x MK 108 with 100 rpg in wing roots
				2 x MK 108 in lower fuselage
37,200 lb (16,874)	40,700 lb (18,461)	518 mph at 20,000 ft 833 km/h at 6,096 m	1,007 mi (1,620)	4 x MK 103 forward firing cannon 1 x MK 103 in tail turret
				1 x MK 103 engine mounted cannon with 70 rounds 2 x MK 151/20 cowl mounted cannon with 200 rpg

PROJECT SPECIFICATIONS, WEIGHTS

COMPANY	PROJECT	ROLE	CREW	ENGINE(S)	WING SPAN (m)	WING AREA (m²)	LENGTH (m)	HEIGHT (m)
HENSCHEL	P 135	Day Fighter	1	1 x HeS 011 A-1	30.18 ft (9,20)	220.66 ft² (20,5)	25.43 ft (7,75)	
	P 187	Day Fighter	1	2 x Argus As 044				
HORTEN	Ho 229 A-1	Day Fighter	1	2 x Jumo 004 B-2	55.11 ft (16,80)	613.56 ft² (57,0)	24.49 ft (7,465)	9.21 ft (2,81)
	Ho 10	Day Fighter	1	1 x HeS 011 A-1	45.93 ft (14,00)		23.62 ft (7,20)	
	Ho 13 B	Day Fighter	1	1 x BMW 003 R	39.37 ft (12,00)		39.37 ft (12,00)	13.77 ft (4,20)
JUNKERS	EF 126/II	Interceptor	1	1 x Argus AS 044	21.81 ft (6,65)			
	EF 127.01	Interceptor	1	1 x HWK 509 C	21.81 ft (6,65)		(7,60)	
	EF 128.01	Day Fighter	1	1 x HeS 011 A-1	29.19 ft (8,90)		21.27 ft (6,485)	8.69 ft (2,65)
LIPPISCH	P 13 a	Research	1	1 x Ramjet	19.68 ft (6,00)	215.28 ft² (20,0)	21.98 ft (6,70)	10.66 ft (3.25)
	P 13 b	Research	1	1 x Ramjet	22.63 ft (6,90)		23.62 ft (7.20)	4.82 ft (1,47)
MESSERSCHMITT	Me 163 A-0	Interceptor	1	1 x HWK R11 203A/B	29.03 ft (8,85)	188.37 ft² (17,5)	18.37 ft (5,60)	
	Me 163 B-1	Interceptor	1	1 x HWK 509 B-1	30.51 ft (9,30)	186.22 ft² (17,3)	19.42 ft (5,92)	9.01 ft (2,74)
	Me 163 C-1	Interceptor	1	1 x HWK 509 C-1	32.15 ft (9,80)	219.58 ft² (20,3)	24.27 ft (7,40)	9.99 ft (3,04)
	Me262HG I	Day Fighter	1	2 x Jumo 004 B-2	41.50 ft (12,65)	265.87 ft² (24,7)	34.77 ft (10,60)	12.56 ft (3.83)
	Me262HG II	Day Fighter	1	2 x Jumo 004 C-1	39.89 ft (12,16)	266.95 ft² (24,8)	34.77 ft (10,60)	12.56 ft (3.83)
	Me262HG III	Day Fighter	1	2 x HeS 011 A-1	40.35 ft (12,30)	306.78 ft² (28.5)	40.68 ft (12,40)	12.56 ft (3.83)
	Me 263 A-1	Interceptor	1	1 x HWK 509 C-4	31.16 ft (9,50)	191.60 ft² (17.8)	25.93 ft (7,90)	10.40 ft (3,17)
	Me 328 C-1	Day Fighter	1	1 x Jumo 004 B	29.52 ft (9,00)	161.24 ft² (14.9)	25.19 ft (7,68)	7.87 ft (2,40)
	Me 155 TL	Day Fighter	1	2 x Jumo 004 B	41.17 ft (12,55)		31.16 ft (9,50)	9.51 ft (2,90)
	P 1070	Day Fighter	1	2 x TL	26.90 ft (8,20)	139.93 ft² (13,0)	26.24 ft (8,00)	9.51 ft (2,90)
	P 1073 B	Midget Fighter	1	1 x BMW 3304	14.43 ft (4,40)		19.35 ft (5,90)	5.90 ft (1,80)
	P 1092.2	Day Fighter	1	1 x Jumo 004 C	32.80 ft (10,00)	136.70 ft² (12,7)	26.57 ft (8,10)	11.97 ft (3.65)
	P 1095.1	Day Fighter	1	1 x Jumo 004 B	32.05 ft (9,77)	164.69 ft² (15,3)		
	P 1099 B	Zerstörer	2	2 x Jumo 004 C	41.37 ft (12,61)	236.81 ft² (22,0)	39.37 ft (12,00)	14.53 ft (4,43)
	P 1101 V1	Research Fighter	1	1 x HeS 011 A-1	26.44 ft (8,06)	146.39 ft² (13,6)	29.46 ft (8,98)	12.20 ft (3,72)
	P 1106.160	Day Fighter	1	1 x HeS 011 A-1	21.81 ft (6,65)	141.01 ft² (13,1)	30.01 ft (9,15)	11.05 ft (3.37)
	P 1110.170	Day Fighter	1	1 x HeS 011 A-1	21.81 ft (6,65)	141.01 ft² (13,1)	31.69 ft (9,66)	8.85 ft (2,70)
	P 1110 ENTE	Day Fighter	1	1 x HeS 011 A-1	16.40 ft (5,00)		31.49 ft (9,60)	10.10ft (3,08)
	P 1111	Day Fighter	1	1 x HeS 011 A-1	30.05 ft (9,16)	301.39 ft² (28,0)	29.26 ft (8,92)	10.03 ft (3,06)
	P 1112 V1	Day Fighter	1	1 x HeS 011 A-0	28.67 ft (8,74)	236.81 ft² (22,0)	27.06 ft (8,25)	10.36 (3.16)
SKODA-KAUBA	P 14.01	Day Fighter	1	1 x Sänger Ram-jet	22.96 ft (7,00)	134.00 ft² (12,4)	32.31 ft (9,85)	13.77 ft (4,20)
SOMBOLD	So 344	Interceptor	1	1 x HWK 509 A-2	18.70 ft (5,70)	64.58 ft² (6,0)	22.96 ft (7,00)	7.15 ft (2,18)

AND ESTIMATED PERFORMANCE STATISTICS

WEIGHT EMPTY (kg)	WEIGHT EQUIP. (kg)	MAX. SPEED AT ALTITUDE	RANGE (km)	ARMAMENT
	12,125 lb (5,500)			2 x MK 108 in wing roots 2 x MG 151/20 in nose
				4 x MK 108 under the fuselage
11,170 lb (5,067)	19,839 lb (8,999)	607 mph at 39,372 ft 977 km/h at 12,000 m		2 x MK 103 with 140 rpg in wing center section, or 4 x MK 108 with 90 rpg in wing center section
				2 x MK 108 in wing center section
				3 x MK 108 or MG 151/20 or MK 213 in nose section
				2 x MG 151/20 in lower nose
				2 x MG 151/20 in lower fuselage
	10,800 lb (4,900)		1,118 mi (1,800)	2 x MK 108 with 100 rpg in wing roots 2 x MK 108 with 100 rpg in lower nose
3,197 lb (1,450)	5,291 lb (2,400)	621 mph 1,000 km/h		
4,200 lb (1,905)	9,500 lb (4,309)	596 mph at 30,000 ft 959 km/h at 9,144 m		2 x MK 108 with 60 rpg in wing roots
4,850 lb (2,200)	11,684 lb (5,300)	596 mph at 30,000 ft 959 km/h at 9,144 m		2 x MK 108 with 50 rpg in fuselage
				2 x MK 108 with 100 rpg for top pair in nose 2 x MK 108 with 80 rpg for lower pair in nose
9,909 lb (4,495)	12.947 lb (5,873)			2 x MK 108 with 100 rpg for top pair in nose 2 x MK 108 with 80 rpg for lower pair in nose
9,825 lb (4,457)	14,764 lb (6,697)	621 mph 1,000 km/h		2 x MK 108 with 100 rpg for top pair in nose 2 x MK 108 with 80 rpg for lower pair in nose
4,640 lb (2,104)	11,354 lb (5,150)	620 mph at 30,000 ft 998 km/h at 9,144 m		2 x MK 108 with 75 rpg in wing roots
				2 x MK 103 in lower fuselage
6,768 lb (3,070)	10,471 lb (4,750)	609 mph 980 km/h		2 x MK 103 with 100 rpg in nose 2 x MG 151/20 with 120 rpg in nose
6,172 lb (2,800)				2 x MG 151 in nose
				2 x MK 103
5,789 lb (2,626)	8,487 lb (3,850)	565 mph at 19,685 ft 910 km/h at 6,000 m	413 mi (665)	2 x MK 103 in nose 2 x MG 151/20 in fuselage
	7,980 lb (3,620)	534 mph at 19,685 ft 860 km/h at 6,000 m		2 x MK 103
11,825 lb (5,364)	23,774 lb (10,784)	500 mph at 29,855 ft 805 km/h at 9,100 m	832 mi (1,340)	2 x MK 103 in dorsal position 1 x MK 214 in the nose 2 x MG 151/20 in the rear fuselage as the FPL 151
4,814 lb (2,184)	7,065 lb (3,205)	534 mph at 22,965 ft 860 km/h at 7,000 m		2 x MK 108 with 100 rpg proposed but not fitted
5,070 lb (2,300)	8,818 lb (4,000)	617 mph at 22,966 ft 993 km/h at 7,000 m		2 x MK 108 in nose
6,172 lb (2,800)	8,818 lb (4,000)	625 mph at 22,966 ft 1,006 km/h at 7,000 m		3 x MK 108 in nose
				4 x MK 108 in nose
	9,440 lb (4,282)	618 mph at 22, 966 ft 995 km/h at 7,000 m		2 x MK 108 in nose 2 x MK 108 in wing root
	10,302 lb (4,673)			4 x MK 108 in fuselage
13,822 lb (6,270)	15,035 lb (6,820)	621 mph at sea level 1,000 km/h at sea level		1 x MK 103 above pilot
1,697 lb (770)	2,976 lb (1,350)			

Index

Notes: Page references in **bold** indicate illustrative material. A "n" indicates a footnote.

Aircraft

CREDITS

PHOTOGRAPHIC - AGENCY

Juan Arroyo - Jorge Riva: 13B, 42; Bell Aircraft Corporation: 52B, 53B, 54, 55, 56; Bayerische Motorenwerke GmbH: 72T; Consolidated Vultee Aircraft Corporation: 150, 185; National Aeronautics and Space Administration: 77; National Air and Space Museum: 102; United States Air Force: 13T, 66, 101M, 101B, 103, 140, 168B, 169B, 170T, 170 BL; United States Army: 99, 100T, 101, 145.

PHOTOGRAPHIC - INDIVIDUALS

Hans H. Amtmann: 19; Robert C. Bracken: 112T; Richard Byrd: 186; Robert B. Casari 149; James V. Crow: 119, 143T; Kenneth Francella: 169TR; Rainer Haufschild: 11; Thomas H. Hitchcock: 6,7,20,21, 38, 72M, 72B, 92, 133, 142BL, 142R, 148M, 164, 171, 183B; Walter Horten: 100B, 101T; Dr. Volker Koos: 142B; Stephen Muth: 70; Willy Radinger: 67, 68; Günter Sengfelder: 14, 35, 36, 37T, 52T, 53T, 136, 137, 144B, 155, 172, 173; William L. Swisher: 69; Jaroslav Zazvonil: 73. All others via the author.

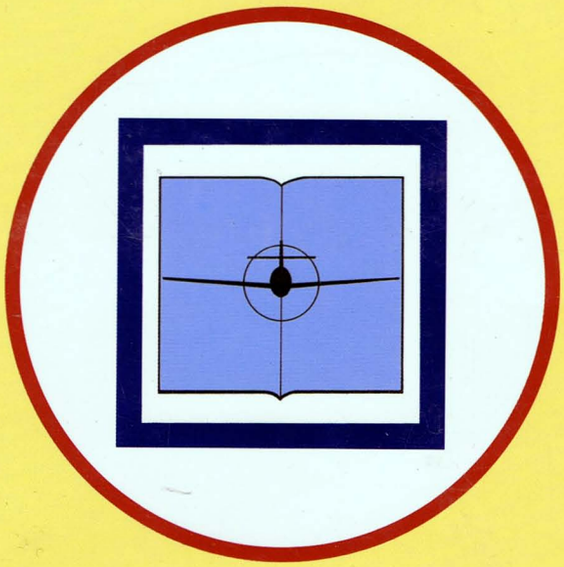
DRAWING AND ILLUSTRATION

John Amendola: 22T, 102; Arthur L. Bentley: 93 - 98; Robert Boyd: 44, 131B, 156; Charles E. Davis: 41, 57, 58B, 60B 159; Dennis Davison: 58T; Todd L. Disrud: 71B, 90B, 132B; Juanita Franzi: 29B, 45M, 45B, 50T, 81, 84M, 85, 86, 108T, 111B 193T; Thomas H. Hitchcock: 35, 37, 50B, 85M, 138, 187, 191B, 192B; Stephen C. Hussey: 106M, 114B, 115B, 136, 137M, 146, 147B, 152M, 153M, 157, 190; Justo Miranda: 46, 75T, 76B, 83B, 111T, 114T, 124B, 154, 164, 174, 175, 179; Roderick J. O'Connor: 176T, 178B; David Pentland: 84 T, 118: Sonny Schug: 22B, 30T, 40, 49, 71T, 105T, 107, 109, 134, 178T, 180, 181, 185M; Günter Sengfelder: 36, 65B, 189B; Thomas A. Tullis: 24, 25, 26, 27, 28, 29T, 29M, 33T, 39M 151T 189; Keith Woodcock: 18T, 39T, 60T, 79T, 87, 127, 186, 192T. All others by Claus Bachmann.

PRODUCTION

Copy Editing: Ann V. Daley, Barbara W. Hitchcock, Jürgen Rosenstock, Cecilia E. Thurlow; **Layout Assistant**: Mark Abair; **Formatting**: COMP Co Inc; **Jacket Mechanicals**: MBI Graphics.

CONTENTS OF VOLUME 2




54995
9 780914 144366